Chapter 3. Affected Environment, Environmental Consequences, and Mitigation

THIS chapter describes the affected environment, and the direct, indirect, and cumulative effects that would be expected to occur as a result of implementing each of the alternatives described in Chapter 2. The resources associated with the significant issues identified in Chapter 2 are discussed first, followed by other resources. In each resource section, the affected environment is discussed initially. In some cases, the regulatory setting is described first, followed by the affected environment section. Impacts are discussed by alternative, with the No Action Alternative discussed first. In the effects section, potential direct, indirect, and cumulative effects are described. Resource commitments and proposed mitigation are discussed for each resource. In most cases, proposed mitigation would apply to all build alternatives; exceptions are discussed in the mitigation sections.

3.1 Terms Used in This Chapter

Short-term and Long-term Effects

In the effects section for each resource, effects are described as either short term or long term. Short-term impacts for this project would persist 5 years after the initiation of revegetation, and primarily would result from temporary construction disturbances that either would be reclaimed, such as cut-and-fill slopes, or would cease, such as construction noise. Short-term impacts of the proposed project would last until 2015, 5 years after the completion of the final construction phase in 2010. Long-term impacts would last more than 5 years after construction. Some long-term impacts would be very long, such as effects on old growth forest, and others would be permanent, such as the visual effects of a wider road.

Direct, Indirect and Cumulative Effects

Direct impacts are those that would be the direct result of implementing one of the alternatives.

Most direct effects from reconstruction would occur from creating cut slopes and placing fill, pavement, or other structures. Indirect impacts (also called secondary impacts) are those that are project-induced, but occur later in time or are farther removed in distance. Dispersed recreation, such as hiking or backpacking, may increase because a reconstructed road would provide easier access and more people would use the area. Such an increase would be an indirect effect. A cumulative effect is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). For example, the combined vegetation impacts from the reconstruction of Segment 4 and Segment 1 of the Beartooth Highway is a cumulative effect.

Irreversible or Irretrievable Commitment of Resources

NEPA requires a discussion of any irreversible or irretrievable commitment of resources that would result from implementing the alternatives. An irreversible commitment of resources means nonrenewable resources are consumed or destroyed. These resources are permanently lost due to project implementation. For the proposed project, fossil fuel resources used during construction would represent an irreversible commitment of resources because their use is lost for future generations. Loss of the historic bridges also would represent an irreversible commitment of resources because, even with reuse of the stone masonry facing, the historic significance and workmanship of the original bridges would be altered.

In contrast to an irreversible commitment of resources, an irretrievable commitment of resources is the loss of resources or resource production, or use of renewable resources during road construction and during the period of time that the road is in place. Irretrievable commitments are not permanent; they are limited to a specific time frame. For the reconstruction of Segment 4, the time frame for irretrievable resource commitments is the period of time that the road remains in place. For example, areas of existing mountain meadow communities would be excavated and the areas would be covered by pavement during reconstruction. This would represent an irretrievable loss of resources and production while the road is in place. If the road is removed at some point in the future, it is possible for the mountain meadow communities to grow (produce) again. Mountain meadow communities disturbed during construction but not covered by an impermeable surface also represents an irretrievable loss of resources. In this case, the period of time between disturbance and complete revegetation represents an irretrievable loss of resources.

3.2 Available Engineering and Environmental Study Reports

The FHWA completed numerous engineering and environmental studies for the proposed project. These studies are documented in technical reports, and are available by submitting a written request to the address on the first page of the abstract. Some of the information in the technical reports may differ from that presented in this EIS where the proposed project information, design, or analysis have been updated. The following technical reports are available:

- Beartooth Highway Road Inventory and Needs Study
- Design Concept Report

- Initial Geohazards Evaluation and Geological Study
- Initial Geotechnical Investigation
- Final Report, Geotechnical Investigation of Selected Features
- Beartooth Highway Retaining Wall Feasibility Study and Geotechnical Recommendations
- Beartooth Ravine Bridge, Structure Selection Reports
- Beartooth Highway Materials Source Investigation, Report 99-14
- Preliminary Materials Report, Report 98-16
- Traffic Study, and Addendums A and B
- Beartooth Highway Traffic Summary Memorandum
- Origin and Destination Survey
- Aesthetic Retaining Wall Options
- Preliminary Drainage Design Report
- Preliminary Cost Estimate
- Final Report, Wetlands, Waters of the U.S., and Riparian Areas
- Final Report, Wildlife Resources
- Final Report, Vegetation, Timber, and Old Growth Forest
- Final Report, Plant Species of Concern
- Final Cultural Resources Survey Reports
- Final Traditional Cultural Properties Reports
- Phase I Environmental Site Assessments
- Topsoil Suitability Report
- Final Visual Assessment Report
- Conceptual Wetland Mitigation Plan
- Wetland Hydrology Report
- Revegetation Opportunities Report
- Biological Assessment
- Biological Evaluation
- Recreation Report
- Construction Noise Report

3.3 Wetlands and Other Waters of the U.S.

Wetland Regulations

Road and bridge construction activities for the proposed project would involve the discharge of fill material or excavation in wetlands or waters of the U.S. The U.S. Army Corps of Engineers regulates these activities under Section 404 of the Clean Water Act. Federal agencies also have responsibilities to avoid, minimize, and mitigate unavoidable impacts on wetlands under EO 11990. The USFS is responsible for managing wetlands, riparian areas, and waters on the SNF under its Land and Resource Management Plan (1986). Project activities that may affect wetlands would need to comply with Section 404, EO 11990, and the Land and Resource Management Plan.

The Corps defines wetlands (33 CFR 323.2[c]) as:

> "…those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Road construction during the 1930s.
Photo © Flash's, Red Lodge, MT

Waters tributary to navigable waters are considered waters of the U.S. and are subject to the Corps' jurisdiction. Wetlands subject to the Corps' jurisdiction (jurisdictional wetlands) meet the Corps' definition of wetlands and are adjacent, neighboring, or have a surface tributary connection to interstate or navigable waters of the U.S. All lakes in the project area are considered jurisdictional because of their tributary nature to interstate waters or their navigability and use by interstate travelers. Beartooth Creek, Little Bear Creek, Canyon Creek, and unnamed tributaries to these streams are jurisdictional due to their tributary nature to the Clarks Fork Yellowstone River, an interstate water. Other unnamed streams are also tributary to the various lakes in the project area. Wetlands adjacent to these tributaries and lakes are also considered jurisdictional for the purposes of Section 404 of the Clean Water Act. Wetlands that meet the Corps' wetland definition but are not adjacent (bordering, neighboring, or contiguous), or have no surface tributary connection to interstate and/or navigable waters are isolated. These resources are not jurisdictional for the purposes of Section 404, but are still aquatic resources. The Corps in Wyoming also does not take jurisdiction over wetlands contained in roadside ditches.

Riparian areas are the zones of vegetation that link terrestrial and aquatic ecosystems, and are found bordering lakes, ponds, reservoirs, estuaries, and ephemeral, intermittent, or perennial streams. Riparian areas do not meet the Corps criteria for wetland soils or wetland hydrology and frequently occur in locations transitional between jurisdictional wetlands and adjoining uplands. The Corps does not regulate placement of fill in riparian areas.

EO 11990 requires federal agencies such as the FHWA and the USFS to "consider factors relevant to a proposal's effect on the survival and quality of the wetlands." EO 11990 requires that adverse effects on wetlands and other waters of the U.S. be avoided where possible in implementing federal actions. Isolated wetlands are afforded protection under EO 11990.

The SNF manages wetlands as part of the riparian/wetland ecosystem under Management Area (MA) 9A (see *Land Use* section). MA 9A encompasses the aquatic ecosystem, the riparian ecosystem, and the adjacent ecosystems that remain within about 30 m (100 ft.) from both edges of perennial streams, lake shores, and other still water bodies. The goals of MA 9A are to provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water body shorelines. Management activities are designed and implemented to sustain inherent visual values that blend with the surrounding natural landscapes.

The wetland near the Clay Butte Lookout turnoff provides important wildlife habitat.

Affected Environment

Wetlands and waters of the U.S. are common throughout the project area. Wetlands in the project area are shown in Figure 32. More detailed maps are presented in Appendix F. Types of wetlands that occur in the project area include: emergent wetlands dominated by grasses, sedges, and rushes; scrub/shrub wetlands dominated by shrub species such as willows; and fens, which have soils with thick organic layers of partially decayed plant materials that have accumulated over thousands of years. Detailed information about wetlands and other waters of the U.S. can be found in the *Final Report, Wetlands, Waters of the U.S., and Riparian Areas* (ERO Resources Corp. 2001b).

Topographic, geologic, and climatic characteristics of the project area create ideal conditions for the formation of deep- and shallow-water lakes, ponds, No known migratory bird nests are located within the area of disturbance, but potential nesting habitat is present in grasslands, sagebrush, forests, and riparian areas. streams, seeps, fens, and wet meadows. The area of jurisdictional and non-jurisdictional wetlands delineated in the project area is about 41 ha (101 ac.).

Wetland Types

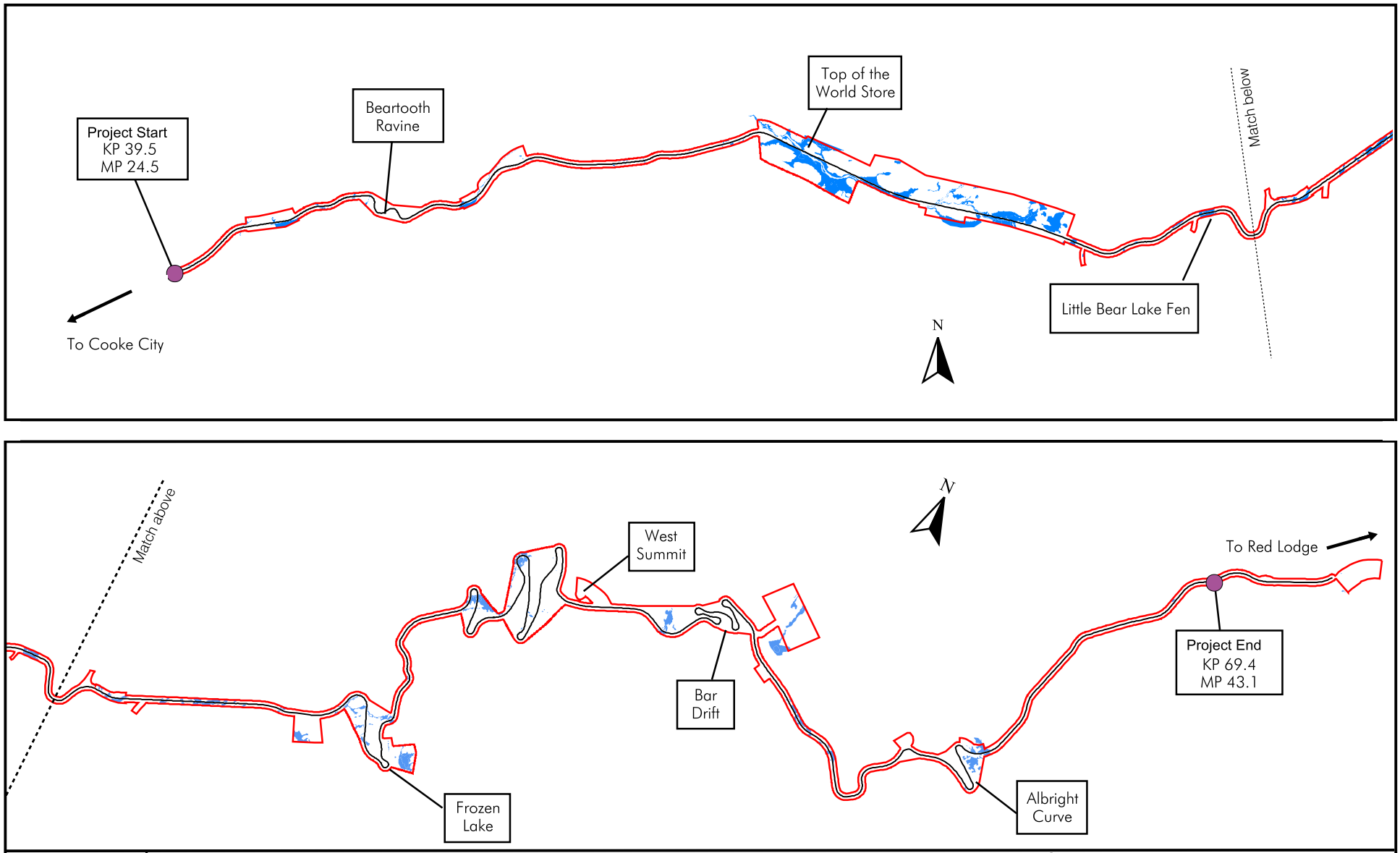
The USFWS developed a national classification system for wetlands so the extent and status of wetland types can be addressed on a national level (Cowardin et al. 1979). The Cowardin classification system describes a hierarchy of wetland systems and classes of wetlands and other waters. All of the wetlands in the project area are classified as palustrine systems under the Cowardin classification system. Wetlands in the palustrine system include vegetated wetlands traditionally called marshes, swamps, fens and wet meadows, as well as shallow water bodies and the shoreline vegetation of rivers, lakes and streams. Wetlands adjacent to the road were in the following Cowardin classes: palustrine emergent persistent; palustrine scrub/shrub; and palustrine forested.

Because wetlands in the project area occur over a broad elevational range, several plant communities and plant species occupy the wetlands. Species composition of wetlands in the project area is described in the *Final Report, Wetlands, Waters of the U.S., and Riparian Areas* (ERO Resources Corp. 2001b).

Palustrine Emergent Persistent Wetlands. Emergent persistent wetlands are the most common wetland type in the project area, and are found in both alpine and subalpine areas. Soils in these wetlands are saturated and/or shallowly inundated with water. Emergent persistent wetlands are dominated by a mix of sedges, grasses, and forbs. Species composition depends on whether the wetland is permanently or seasonally saturated, and the zone (alpine or subalpine) in which the wetland occurs.

Fens are a type of emergent persistent wetland with an upper layer of over 20 cm (8 in.) of organic soils. The organic material may have been deposited over thousands of years to accumulate to these depths. Fens often occur in subalpine and alpine areas, generally in glacially formed basins where soils are continually saturated with water.

Fen plant communities are similar to those found in other wetlands, and species composition is not useful for distinguishing fens from surrounding wetlands. Some communities with mud sedge, buckbean, and cottongrass, however, were observed only in fens. In addition, fens often have a high cover of bryophytes (mosses and liverworts). Ten plant species of concern were observed in fens in the project area (see *Vegetation, Timber, and Old Growth Forest* section).



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

Project start and end

Wetland

Study area boundary

Source: ERO Resources, Wetlands, Waters of the U.S., and Riparian Areas 2001

1 Inch = 4,000 Feet

Figure 32
Wetlands in the Project Area

File: 521\Wetlands\Wetland Mitigation\Maps\newwetmit.apr

Palustrine Scrub/Shrub Wetlands. Scrub/shrub wetlands in the project area are associated with small streams and are located in the bottoms of drainages or on floodplain terraces. Willows dominate scrub/shrub wetlands. Other vegetation in scrub/shrub wetlands varies with elevation.

Palustrine Forested Wetlands. Forested wetlands are the least common wetland type in the project area and are found adjacent to area creeks. Two forested wetlands were found in the project area: one at the Beartooth Lake outlet next to Beartooth Creek, and the other upstream of the Little Bear Creek bridge #2 east of Top of the World Store. Both areas are periodically inundated during high flows. Conifers dominate the over-story of these wetlands, and willows are scattered in openings in the tree canopy.

Other Waters of the U.S.

Lakes. Two types of lakes are present in the project area—small lakes in depressions with no outlet, and lakes with a defined outlet stream. Both types of lakes have varying amounts of wetland fringe. Lakes with steep shores tend to have limited associated wetlands (for example, Beartooth Lake near the road). Lakes with gently sloping shores or with an adjacent terrace support extensive emergent wetlands (for example, the south end of Little Bear Lake).

Streams. Four creeks drain the project area. Beartooth Creek, and its tributary, Little Bear Creek, drain the area from the west end of the project area to Long Lake. Canyon Creek drains from Long Lake to west of the West Summit. Littlerock Creek drains the area south of the road between East Summit and West Summit. Rock Creek, which flows north into Montana, drains the area north of the road and east of the West Summit. All creeks are in the watershed of the Clarks Fork Yellowstone River.

Most streams in the project area originate in alpine basins and are fed by precipitation and melting snow. Peak flow typically occurs in late June or early July. Surface water is discussed in the *Water and Aquatic Resources* section.

Pool and Riffle Complexes. Like wetlands, pool and riffle complexes are considered special aquatic sites. Steep sections of the streams in the project area are typically characterized by riffles and pools. Riffle and pool complexes provide valuable habitat for fish and wildlife.

Wetland Functions and Values

Wetland functions are the physical, chemical, and biological processes or attributes vital to the integrity of wetland systems (Adamus et al. 1991). Wetland functions and values in the project area were evaluated using the Montana Wetland Field Evaluation Form and Instructions (Montana Department of Transportation 1996). The "Montana Method" provides a system for rating wetland functions using a classification system that combines the USFWS wetland classification system (Cowardin et al. 1979) with a hydrogeomorphic wetland classification (Brinson 1993). The *Final Report, Wetlands, Waters of the U.S., and Riparian Area* provides additional description of the Montana Method (ERO Resources Corp. 2001b).

Most wetlands in the project area, such as palustrine persistent emergent and palustrine scrub/shrub, were rated high for the following functions:

- Ground water discharge/recharge
- Production export and food chain support
- General wildlife habitat

Wetlands that occur along streams or lakes, which account for about half of the wetlands evaluated, were rated high for:

- General fish/aquatic habitat (where applicable)
- Recreation/education potential
- Dynamic surface water storage

Other functions for which some wetlands were rated high were sediment/shoreline stabilization, and uniqueness. The functions of flood attenuation/storage and sediment/nutrient/toxicant removal were rated either moderate or low, or were not applicable to certain types of wetlands.

Environmental Consequences

Effects of the No Action Alternative

Because no construction would occur, the No Action Alternative would have no direct or indirect impacts on wetlands or other waters of the U.S. Periodic road maintenance likely would occur at a similar rate and in a similar manner as it has in the past. Routine maintenance activities would not affect wetlands. Effects on wetlands from the current road alignment would remain. The existing road alignment filled many wetlands, modifying or eliminating wetland hydrology and functions.

Effects of the Build Alternatives

Direct Effects on Wetlands and Fens. Direct impacts on wetlands and fens would range from 2.5 to 3.2 ha (6.2 to 7.8 ac.) in the build alternatives. Alternative 5 would affect the least amount of wetlands (2.5 ha [6.2 ac.]), and Alternative 4 would affect the most wetlands (3.2 ha [7.8 ac.]) including less than 0.1 ha (less than 0.1 ac.) of fens. The preferred alternative (Alternative 6) would affect 2.6 ha (6.6 ac.) of wetlands. Most of the effect would be on jurisdictional wetlands (Table 7). Direct impacts on fens would be avoided in Alternatives 2, 3, 5, and 6. In Alternative 4, fill would be placed in less than 0.1 ha (less than 0.1 ac.) of a fen complex near the Albright Curve. No wetlands would be affected at the material source or workcamp sites.

For project planning purposes, all wetlands within the proposed construction limits have been considered impacted. This includes temporary and permanent wetland impacts. Temporary impacts may include the operation of construction equipment or temporary placement of fill. During final design, additional ways to further minimize temporary and permanent impacts would be identified, and the area of temporary versus permanent wetland impacts would be quantified.

Table 7. Wetlands within the proposed construction limits.

Type	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Jurisdictional wetlands	0.0	0.0	2.4	6.0	2.2	5.4	2.5	6.1	1.9	4.8	2.0	5.0
Non-jurisdictional wetlands	0.0	0.0	0.6	1.6	0.6	1.5	0.7	1.7	0.6	1.4	0.6	1.5
Fens	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0
Total	0.0	0.0	3.0	7.6	2.8	6.9	3.2	7.8	2.5	6.2	2.6	6.6

Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.
Impact assessment includes both permanent impacts (fill) and temporary impacts (within the construction limit).

Many of the wetland impacts would occur in subalpine areas. Impacts on alpine wetlands would range from 0.7 ha (1.6 ac.) in Alternative 5 to 0.8 ha (2.0 ac.) in Alternatives 2 and 4. The preferred alternative (Alternative 6) would affect 0.7 ha (1.8 ac.) of alpine wetlands. As discussed in the following *Proposed Mitigation* section, opportunities to mitigate alpine wetlands were investigated, but none were identified.

Scrub/shrub and emergent persistent wetlands would be the wetland functional classes most affected by the build alternatives. Examples of scrub/shrub and emergent persistent wetlands impacted by the build alternatives would be those at the Top of the World Store area and at the Long Lake outlet.

Indirect Effects on Wetlands. Several factors may cause indirect effects to wetlands, including shading, disruption of supportive hydrology or loss of vegetative buffers. In the proposed project, most of these impacts would be avoided or minimized. Culverts and other structures would avoid potential indirect impacts to wetlands and fens by maintaining a hydrological connection between wetlands on either side of the road. Existing culverts have been mapped and existing drainage would be maintained to the greatest extent practicable as part of any build alternative. Some indirect wetland impacts may result from the decrease or elimination of a vegetation buffer between the road and wetlands. Buffers function as pollutant filters for road runoff and vehicle emissions, and improve the water quality before it reaches wetlands and waters of the U.S. An increase in water-borne pollutants would have minimal effect on the roadside wetlands.

Assessment Methods. To assess the potential for wetlands to be indirectly impacted by changes in hydrology under the build alternatives, all areas where the existing and proposed alignments cross wetlands were identified, and cross sections of the preliminary road design were examined. Many of these locations also were reviewed in the field. In most areas, a preliminary assessment determined that the proposed realignment likely would not affect wetlands indirectly for several reasons: 1) the road would be constructed on fill that would allow ground water movement; 2) bedrock would be present under the proposed alignment, or 3) removal of the existing road could restore natural wetland hydrology.

In other areas, where the proposed alignment would cut directly upslope, downslope, or through a wetland, or where removal of the existing road could alter wetland hydrology, a more detailed assessment was completed. Ground water monitoring wells were installed to provide hydrologic information. Ground water monitoring wells and surface water monitoring gages were placed in the Top of the World Store and the Frozen Lake Curve areas where realignment options potentially could alter wetland hydrology. Measured ground water levels were used to assess hydrologic conditions that could be indirectly affected. The potential for highway realignments to indirectly affect wetlands was assessed by examining the depth and flow direction of ground water, and the excavation depths proposed under each alternative.

Areas of No Indirect Effect. Based on the preliminary assessment, it is unlikely that wetlands would be affected indirectly in any build alternative in the Beartooth Ravine, Little Bear Lake or Bar Drift. At the Little Bear Lake fen, a bridge would be constructed so that ground water flow would be uninterrupted. Runoff from the new bridge crossing the fen would be conveyed to the areas adjacent to the fen. Either option may increase shading on the north side of the road, but

the shading would not affect the function of the large fen on both sides of the road.

Based on an initial assessment, it appears that snowmelt and ground water discharge provide the supporting hydrology for the fen. The fen has taken thousands of years to form. Removing some or all of the fill from the fen is likely to either not affect the hydrology, or to restore the hydrology present prior to road construction. The FHWA is conducting further hydrology studies to assess the feasibility of removing the existing road fill material for wetland restoration.

Except for the areas discussed in the following section, indirect effects were considered unlikely in all other areas based on review of preliminary proposed road cross sections, field inspections, and analysis of ground water data from monitoring wells. The material placed in wetlands in areas proposed to be widened would be designed to allow ground water to flow through the fill. Fills in wetlands would be designed to meet site-specific conditions. Before placing the road subgrade in a wetland, several steps typically would occur. The wetland beneath the proposed subgrade would be excavated to varying depths, depending on the depth of suitable bearing material. Large diameter crushed rock would be placed in the excavation and covered with a geotextile fabric cap. The subgrade would be placed on the geotextile fabric. Construction details would be finalized during final design. The proposed design would allow ground water to maintain its pre-construction flow path and level. The geotextile cap placed on the crushed rock backfill would prevent embankment soil materials from settling into voids in the crushed rock, which would reduce permeability.

Areas of Potential Indirect Effects. Based on the preliminary assessment, several areas where wetlands could be indirectly affected were identified. These areas are: the Top of the World Store area in Alternatives 2, 5, and 6; the Frozen Lake Curve in Alternative 4; and the Albright Curve in Alternative 4. These areas were examined in more detail and are discussed below.

Top of the World Store Option B-Alternative 2. At the Top of the World Store, the realignment option proposed in Alternative 2 (Option B) would emerge from the forest at the western end of the Top of the World Store area, traverse south of the existing alignment, cross Little Bear Creek south of the Top of the World Store, and continue on the north side of the existing alignment until it returns to the existing alignment at the Island Lake turnoff.

Where Option B would traverse to the south of the existing alignment, the proposed alignment would cross an existing wetland and then traverse upslope of the wetland. The proposed excavation may encounter the ground water table and may indirectly affect the hydrology of a small area of the wetland uphill of the road. Where the proposed realignment would cross the wetland, the water level beneath a small area of wetland on the upslope side of the excavation could be lowered. However, it is unlikely that the supportive hydrology for the wetland would be lost entirely because of the proposed shallow excavation in this area. Also, the compaction necessary for the upper portion of the roadbase, including the asphalt and the underlying area, could prevent ground water flow in the upper portion of the roadbase, but this would unlikely affect wetlands downslope because the depth of compaction would be shallow and the ground water would flow freely through the materials beneath the roadbase. Subexcavating and placing rock in the subexcavated area before placing the roadway embankment would allow water to pass freely.

For Alternative 2, indirect impacts also may occur where Option B would cross a small drainage west of Top of the World Store that flows north to Little Bear Creek. In this area, subexcavation and backfilling with rock would be necessary to construct the road. Subexcavation for these actions could disrupt some of the ground water supplying wetlands upslope of the road. Drainage flows would be placed in a culvert, and only limited soil compaction, as described previously, would be necessary. Excavation for Alternative 2 probably would not affect wetlands downslope of the proposed realignment.

In Option B, removal of the existing road on the west side of the Little Bear Creek bridge #1 may slightly alter the hydrology of wetlands upslope (south) of the existing road, because the road may be acting as a dam, raising the ground water level in the area south (upslope) of the road. In this area, ground water monitoring wells indicate that ground water flows from south to north under the existing road. The ground water surface elevation is 0.30 m (1 ft.) higher on the south side of the existing road than on the north side of the road.

East of the Top of the World Store, Option B would traverse north of the existing road, and would cross uphill of several wetlands. The proposed realignment would not impact wetlands downhill from the road because the road would be either elevated above the existing ground surface or placed on a bedrock outcrop. Removal of the existing road in this area might slightly lower the ground water level at the location of the former road, but this likely would not indirectly affect the wetlands adjacent to the road because the direction of ground water flow would not be altered.

Top of the World Store Option A-Alternatives 5 and 6. The realignment proposed in Alternatives 5 and 6 (Option A) have the same potential for indirect effects on a wetland east of Little Bear Creek bridge #1 in the Top of the World Store area where the road emerges from the forest. Option A would be similar to Option B, and the potential for indirect impacts would be similar. Option A would not, however, cross the Little Bear Creek tributary drainage to the west of Top of the World Store described previously under Alternative 2.

Where the existing road would be removed west of the Little Bear Creek bridge #1, minor indirect impacts to wetlands may occur. Removal of the section of the existing road was described previously under Alternative 2. No other indirect effects would be expected in Alternatives 5 and 6 in the Top of the World Store area.

Frozen Lake Curve Option B-Alternative 4. At the Frozen Lake Curve, all build alternatives would closely follow the existing alignment except Alternative 4. Option B proposed in Alternative 4 would curve farther north than the existing switchback. This realignment would not indirectly impact any wetlands because ground water flow is parallel to the northern edge of the proposed road alignment, and the proposed alignment does not cut off ground water flow to wetlands in this area.

Albright Curve-Alternative 4. The realignment proposed in all build alternatives except Alternative 4 would closely follow the existing alignment in those areas that are upslope of existing wetlands. The realignment option proposed in Alternative 4 (Option B) would not have indirect effects to wetlands because no soil excavation is proposed, and ground water movement would not be impeded. Topsoil would be salvaged prior to the addition of subgrade, and no excavation would be required.

Other Waters of the U.S. All build alternatives would affect 0.2 ha (0.25 to 0.45 ac.) of lakes and ponds (Table 8). These impacts would

be due to widening the road along Little Bear Creek (all build alternatives), improving bridge crossings (Alternatives 3 and 4), or constructing new bridge crossings (Alternatives 2, 5, and 6). All build alternatives would fill about 616 m^2 (0.15 ac.) of Long Lake. Pool and riffle complexes would not be affected. Road widening, construction of bridge abutments, and new culverts associated with new ephemeral stream crossings would impact between 595 linear m (1,952 ft.) and 646 m (2,119 ft.) of streams (Table 8).

Wetland Functions and Values. The functions associated with the wetland types that most commonly would be impacted under the build alternatives are:

- Ground water discharge/recharge
- Production export and food chain support
- Dynamic surface water storage

Additional functions that would be lost as a result of impacts on other wetland types are:

- General wildlife habitat
- General fish/aquatic habitat
- Sediment and shoreline stabilization
- Flood attenuation/storage
- Sediment/nutrient/toxicant removal

Cumulative Effects. Other foreseeable activities in the area include the widening of 13.5 km (8.4 mi.) of U.S. 212 between the northeast entrance to YNP and the Montana/Wyoming state line east of Cooke City. As proposed, this project would entail 1.1 ha (2.6 ac.) of wetlands impacts. Cumulatively, wetland impacts of the two projects would range from 3.7 to 4.3 ha (8.8 to 10.4 ac.).

Resource Commitments. All build alternatives would result in an irreversible commitment of resources. All build alternatives would fill alpine wetlands, and functions and values provided by these wetlands would be lost for the foreseeable future. In Alternative 4, an irreversible commitment of resources would occur when fill for roadbase would be placed in less than 0.1 ha (less than 0.1 ac.) of fen. Alpine wetlands and fen impacts are considered irreversible because of the amount of time required for generation of these resources.

Subalpine wetlands, other than fens, filled by implementing any build alternative would represent an irretrievable commitment of resources. The amount and types of impacts on wetlands and waters of the U.S. would be similar for all build alternatives. Functions and values of wetlands would be altered or eliminated by road construction. Proposed wetland mitigation would provide similar functions and values of affected non-alpine wetlands.

Table 8. Other Waters of the U.S. within project construction limits.

Other Waters of the U.S.	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Lakes and ponds*	0.0	0.0	0.1	0.25	0.1	0.25	0.2	0.45	0.1	0.25	0.1	0.25
	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.
Streams†	0	0	642	2,106	610	2,001	646	2,119	595	1,952	607	1,991

*Includes jurisdictional other waters and <0.1 ha (<0.1 ac.) of isolated other waters at Frozen Lake.
†All streams within project construction limits are jurisdictional.

Proposed Mitigation

Mitigation Strategy. In developing a wetland mitigation strategy, the FHWA followed the 404(b)(1) guidelines of 40 CFR 230, the Memorandum of Agreement between the COE and the EPA concerning wetland mitigation (Corps and EPA 1990), Federal Guidance on In-Lieu Fee arrangements (Corps et al 2000), and the Corps Regulatory Guidance Letter No. 02-2 (Corps 2002). Wetland mitigation would involve two approaches: primarily avoidance and minimization of wetland impacts; and secondarily restoration, creation or preservation of wetlands to compensate for unavoidable impacts on wetlands.

To the greatest degree possible, impacts on wetlands in the project area have been avoided and minimized. Attention has been focused on avoiding and minimizing impacts on riverine wetlands (streams and adjacent vegetation) because riverine wetlands provide the greatest number of highly rated functions in the project area. Likewise, minimizing impacts on fens and alpine wetlands was a priority because these wetland systems are extremely sensitive and mitigation opportunities are limited.

In developing the preliminary design, the FHWA used environmental resource information and mapping of features such as wetlands, fens, and wildlife crossings to shift the alignment or to modify the roadway design to avoid and minimize impacts. The FHWA held numerous field reviews with the cooperating agencies to review and modify the alternative alignments and roadway design. The proposed build alternatives are the result of several iterations of design refinements based on the resource information and mapping and field reviews. Coordination and field reviews would continue as the design progresses. For example, all parking area and pullouts would be reviewed in the field to ensure new impacts to wetlands would not occur. The FHWA has applied and would continue to apply the techniques in the *Techniques to Avoid and Minimize Impacts* section.

Mitigation for Temporary Impacts. The FHWA would mitigate all temporary impacts to wetlands. Best management practices, such as silt fencing and temporary soil tackifiers, would be used to help prevent erosion and siltation from construction activities. The WDEQ's BMPs designed to reduce or eliminate water quality degradation due to physical modifications of surface water would be used (WDEQ 1999). Wetlands that are temporarily impacted during construction would be regraded and revegetated to allow the re-establishment of wetlands.

Mitigation for Permanent Impacts. Proposed mitigation for unavoidable permanent wetland impacts is described in a *Conceptual Wetland Mitigation Plan* (ERO Resources Corp. 2002a), and would involve both on- and off-site mitigation. In developing the plan, opportunities were considered in the following order:

- On-site wetland restoration
- On-site wetland creation
- Off-site wetland creation
- Off-site wetland preservation and restoration

On-site mitigation opportunities would consist of wetland restoration, with some wetland creation. The FHWA reviewed all of the project area to locate suitable on-site wetland mitigation opportunities in the same environments in which impacts would occur under the build alternatives. These opportunities were reviewed in the field with representatives from the SNF and the Corps. Because most potential on-site wetland creation opportunities would involve impacts to existing,

high quality meadows, large wetland creation sites were eliminated from further consideration (FHWA 2000). For example, in alpine sections of the project site, impacts to alpine vegetation that would result from construction of a mitigation wetland would outweigh the value of the constructed wetland. Consequently, no alpine wetland mitigation opportunities were identified and all on-site wetland restoration and creation would take place in subalpine areas. On-site wetland mitigation is possible at 10 sites located in the Top of the World Store area, at the Little Bear Lake fen, at Long Lake, and at an abandoned gravel pit in the Frozen Lake area (Figure 33). Monitoring of restored wetlands would be conducted after restoration is completed.

Identified off-site wetland mitigation opportunities would consist of wetland creation, preservation, and restoration. The FHWA also investigated wetland mitigation banking. However, no wetland mitigation banks are located in the project area, and there are no suitable wetland mitigation credits available in Wyoming for this project (DiRienzo 2002).

On-Site Wetland Restoration. On-site wetland restoration would involve establishing wetlands in areas where the existing roadway would be removed from areas that were historically wetlands. Opportunities for on-site wetland restoration range from 1.0 to 1.2 ha (2.6 to 3.0 ac.) for Alternatives 2, 5, and 6 (Table 9). Most of the restoration would occur in the Top of the World Store area. Because Alternatives 3 and 4 would not realign the road in the Top of the World Store area, opportunities for restoration at the Top of the World Store area with these alternatives would be less than 0.1 ha (0.1 ac.).

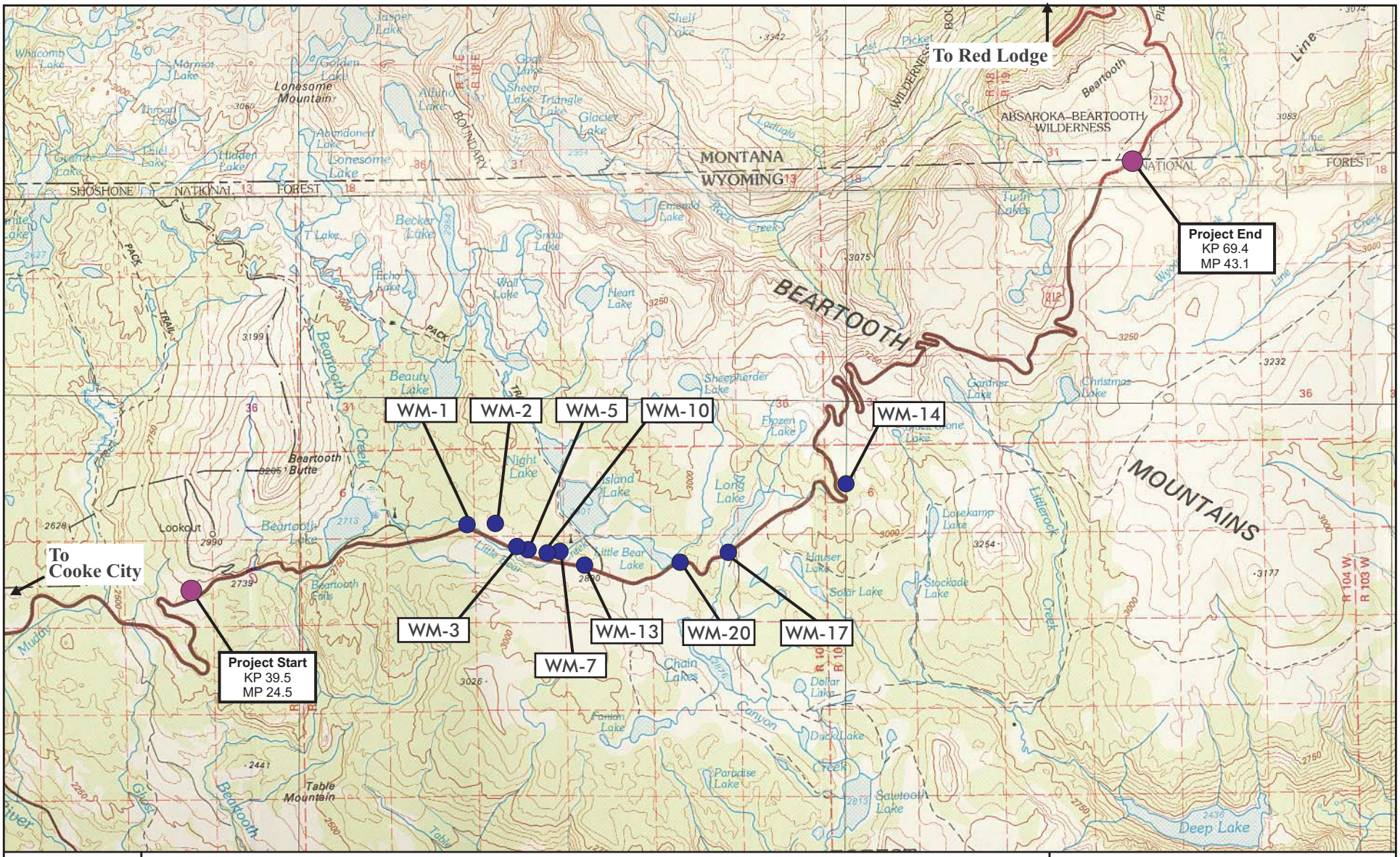
In Alternatives 5 and 6, a bridge would be built on piers in an area where the existing road crosses a fen. Some of the existing road overlays fen soils, and the road would be removed after bridge construction. The bridge would shade some restored fen, but most (0.2 ha [0.4 ac.]) would not be in constant shade and could be revegetated. All of the remainder probably would not support vegetation, but would be saturated to shallowly inundated, underlain by fen soils.

Table 9. On-site wetland mitigation opportunity by alternative.

Type of Site	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Restoration	0.0	0.0	1.1	2.7	<0.1	0.1	<0.1	0.1	1.2	3.0	1.2	3.0
High Priority Creation	0.0	0.0	0.4	1.1	0.3	0.7	0.3	0.6	0.4	1.0	0.4	1.0
Subtotal	0.0	0.0	1.5	3.8	0.3	0.8	0.3	0.7	1.6	4.0	1.6	4.0
Low Priority Creation	0.0	0.0	1.0	2.5	1.0	2.4	1.0	2.5	1.0	2.6	1.1	2.6
Total Mitigation Opportunity	0.0	0.0	2.5	6.3	1.3	3.2	1.3	3.2	2.7	6.7	2.7	6.7
Total Wetland Impact[†]	0.0	0.0	3.0	7.6	2.8	6.9	3.2	7.8	2.5	6.2	2.6	6.6

[†]see Table 7 for the area of wetland impact.

Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.



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- Project Start and End
- Possible Wetland Mitigation Site

1/2 Inch = 1 Mile

N

Figure 33
Possible On-Site Wetland Mitigation Sites

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High Priority On-Site Wetland Creation. High priority on-site wetland creation generally would involve excavating small subalpine upland areas to match the elevation of an adjacent existing wetland or stream. High priority wetland creation sites would be those areas that have been disturbed previously or those areas where impacts on existing plant communities would be minimal. Opportunities for high priority on-site wetland creation range from 0.3 to 0.4 ha (0.6 to 1.1 ac.) for all build alternatives (Table 9).

Low Priority On-Site Wetland Creation. Several other areas were considered for on-site wetland mitigation to help meet the wetland mitigation requirements under the build alternatives. However, these sites would involve excavation and wetland creation in undisturbed high-quality subalpine or montane meadow communities. Creation of wetlands in these areas is considered a low priority because the gain in wetland resources would come at the loss of existing subalpine and montane communities. Opportunities for low priority on-site wetland mitigation for all build alternatives range from 1.0 to 1.1 ha (2.4 to 2.6 ac.).

Probable Wetland Mitigation. The areas presented in Table 9 represent the total area identified at the 10 on-site mitigation sites. Not all of the 10 sites identified probably would develop into functioning wetlands. For planning purposes, the FHWA applied a "success factor" to the area shown in Table 9. For the high priority restoration and creation sites, a success factor of 90 percent was applied. The high priority restoration and creation sites have a high likelihood of success because of favorable topographic and hydrologic conditions. A success factor of 60 percent was applied to the low priority sites. The low priority mitigation sites would be less successful than the high priority sites because of less favorable topographic and hydrologic conditions. Areas likely to develop into functioning wetlands range from about 0.9 ha (2.1 ac.) for Alternative 3 and 4 to 2.0 ha (5.2 ac.) for Alternative 2 (Table 10). Because on-site wetland mitigation would not mitigate all unavoidable wetland impacts, the FHWA investigated off-site mitigation opportunities.

Off-Site Wetland Creation. Off-site wetland mitigation was considered only after all on-site mitigation opportunities had been examined. The FHWA investigated off-site wetland mitigation at

Table 10. Probable wetland mitigation by alternative.

Type of Site	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
High priority sites (90% success factor)	0.0	0.0	1.4	3.4	0.3	0.7	0.3	0.6	1.4	3.6	1.5	3.6
Low priority sites (60% success factor)	0.0	0.0	0.6	1.5	0.6	1.4	0.6	1.5	0.6	1.6	0.6	1.6
Total	0.0	0.0	2.0	4.9	0.9	2.1	0.9	2.1	2.0	5.2	2.0	5.2
Total wetland impact[†]	0.0	0.0	3.0	7.6	2.8	6.9	3.2	7.8	2.5	6.2	2.6	6.6

[†]see Table 7.

Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.

the Pilot Creek gravel pit. This potential option for off-site wetland creation would be the same under all build alternatives. Off-site wetland creation at this location originally was considered a low priority because of the depth to ground water. However, during the spring of 2003, high flows from Pilot Creek flowed into the gravel pit. The FHWA is examining the possibility of creating wetlands using high flows from Pilot Creek. It is estimated that between 0.4 and 1.2 ha (1 and 3 ac.) could be created at the site. Wetland creation at the site would likely be surrounded by a large area (up to 4 ha (10 ac.)) of upland and riparian restoration, so diverse habitats would be incorporated into the mitigation site design. No other off-site wetland creation opportunities were found near the project area.

Off-Site Wetland Preservation and Restoration. Another option for off-site wetland mitigation would be the same in all build alternatives. The option would involve preservation of high quality wetlands, and possible restoration of filled and degraded wetlands. The Corps recognizes preservation of existing wetlands as an important type of compensatory mitigation as a means of obtaining the goal of no net loss of wetlands (U.S. Army Corps of Engineers et al. 2000; U.S. Army Corps of Engineers 2002).

The FHWA considered using off-site preservation for compensatory wetland mitigation because other wetland mitigation opportunities would be insufficient to mitigate all impacts. A large part of the proposed project is in undisturbed alpine and subalpine areas. Although restoration of wetlands would be possible in most of the build alternatives, the area available for restoration would not be large enough to fully compensate for the impacts of the build alternatives. Creation of new wetlands on-site sufficient to mitigate all impacts would disturb existing vegetation communities, increasing the total adverse impacts of the project. Off-site wetland creation at Pilot Creek gravel pit was considered a low priority. No other off-site wetland creation opportunities were found near the project area.

The FHWA identified some off-site mitigation opportunities between the proposed Segment 4 reconstruction area and YNP. These sites are being considered because they contain wetlands dominated by stands of willows, and are located in areas where the land has been or could be subdivided for development. The preferred site contains willow assemblages consisting of palustrine scrub/shrub and persistent emergent wetlands that are uncommon in the YNP area. These willow assemblages provide valuable habitat for species such as moose, which rely on willow assemblages for winter browsing. The scrub/shrub wetlands are dominated by numerous willow species, which are uncommon in YNP and surrounding areas. Wolf willow, a GNF Forest Service sensitive species, and Farr willow, a SNF sensitive species are found in at least one site, and may be found on more sites. Additional survey work may be necessary for the final mitigation plan.

Because of the extensive willow communities, the preferred site provides valuable wildlife habitat. The site is a high priority for preservation because the land has been subdivided for development, has extensive willow communities present, provides valuable wildlife habitat, and is in close proximity to YNP. The site also provides an opportunity for wetland restoration. Roads constructed through the site have filled wetlands. The roads could be removed and restored as wetlands.

Functions and Values. The proposed on-site wetland mitigation sites would provide functions and values similar to the impacted wetlands. The

on-site mitigation wetlands would provide ground water discharge/recharge functions because they would be placed adjacent to existing wetlands and would be excavated to access the ground water table that supports the existing wetland. On-site mitigation wetlands would provide production export and food chain support functions because they would provide a source of plant material, invertebrates and microorganisms for adjacent uplands, wetlands, and areas of open water.

Off-site wetland creation at the Pilot Creek gravel pit provides 1:1 replacement of wetland functions and values. Wetlands that could be created at the Pilot Creek gravel pit would include areas of upland and riparian habitats, creating valuable wildlife habitat. Wetlands created at Pilot Creek likely would rate high for the following functions:

- General wildlife habitat
- Sediment/nutrient/toxicant removal
- Ground water discharge/recharge

A functional assessment was performed on wetlands in the preferred off-site location. The existing wetlands in the site received high functional ratings for general wildlife habitat, general fish/aquatic habitat, sediment/nutrient/toxicant removal, and ground water discharge/recharge. Restored wetlands in the preferred off-site location would provide similar functions.

Only Practicable Alternative Finding

The following discussion documents the compliance of the preferred alternative (Alternative 6) with the requirements of EO 11990. EO 11990 requires that adverse effects on wetlands and other waters of the U.S. be avoided where possible in implementing federal actions. For Alternative 6, the preferred alternative, the road alignment would follow the existing alignment closely, except in the following areas:

- Beartooth Ravine area
- Top of the World Store area
- Bar Drift
- Albright Curve

Impacts on wetlands have been minimized throughout the design process. During iterative field reviews, the road design was modified to minimize wetland impacts using the techniques discussed in the *Techniques to Avoid and Minimize Impacts Section*.

All wetland would be avoided at the Beartooth Ravine. The wetland effects with the preferred Bar Drift alignment option would be similar to the impacts from other options considered (Appendix E). At the Frozen Lake realignment area, the wetland impacts of the existing alignment option and option A are similar. The Little Bear Lake Fen option area involves no new direct wetland impacts with the bridge option. Wetland impacts with the proposed Albright Curve option is similar to the other two options.

In the Top of the World Store area, much of the existing roadway in this area was constructed in wetlands. Two realignment options were considered to limit impacts on wetlands in the Top of the World Store area. Option A (Alternatives 5 and 6) would involve 0.4 ha (1 ac.) fewer new impacts on wetlands than the existing alignment option (Alternatives 3 and 4), because widening the road in its existing alignment would involve wetland impacts where the road crosses existing wetlands. Option B, which is included in Alternative 2, would involve more impacts on wetlands in the Top of the World store area than Option A (Alternatives 5 and 6), but fewer than the existing alignment option (Alternatives 3 and 4). For all build alternatives, potential effects would be minimized by using the existing roadbed and

roadway corridor where possible, and by implementing feasible mitigation measures. Restoration of wetlands affected by the existing road would occur under both options.

Based upon the above considerations, it is determined that there is no practicable alternative to the proposed construction in wetlands and that Alternative 6 would include all practicable measures to minimize harm to wetlands that may result from such use.

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3.4 Cultural Resources and Traditional Cultural Properties

Cultural resources include a broad range of items and locations. Some examples of cultural resources are archaeological materials and sites (specified in 43 CFR 7), standing structures that are over 50 years of age or are important because they represent a major historical theme or era (specified in 36 CFR 800), and sacred sites that have importance for Native Americans (specified in EO 13007). The National Historic Preservation Act of 1966 (as amended), and its implementing regulations (36 CFR 800), require federal agencies to consider effects on cultural resources before undertaking any actions. Cultural resources can be separated into two groups: historic and prehistoric. Cultural resources are considered historic if they are more than 50 years old, and prehistoric if they date to the period before Euroamerican contact. If cultural resources meet certain criteria, they are considered eligible for listing in the National Register of Historic Places (NRHP). If a proposed project would alter or affect the characteristics for which the resources are eligible, measures must be developed and implemented to minimize or mitigate the effects.

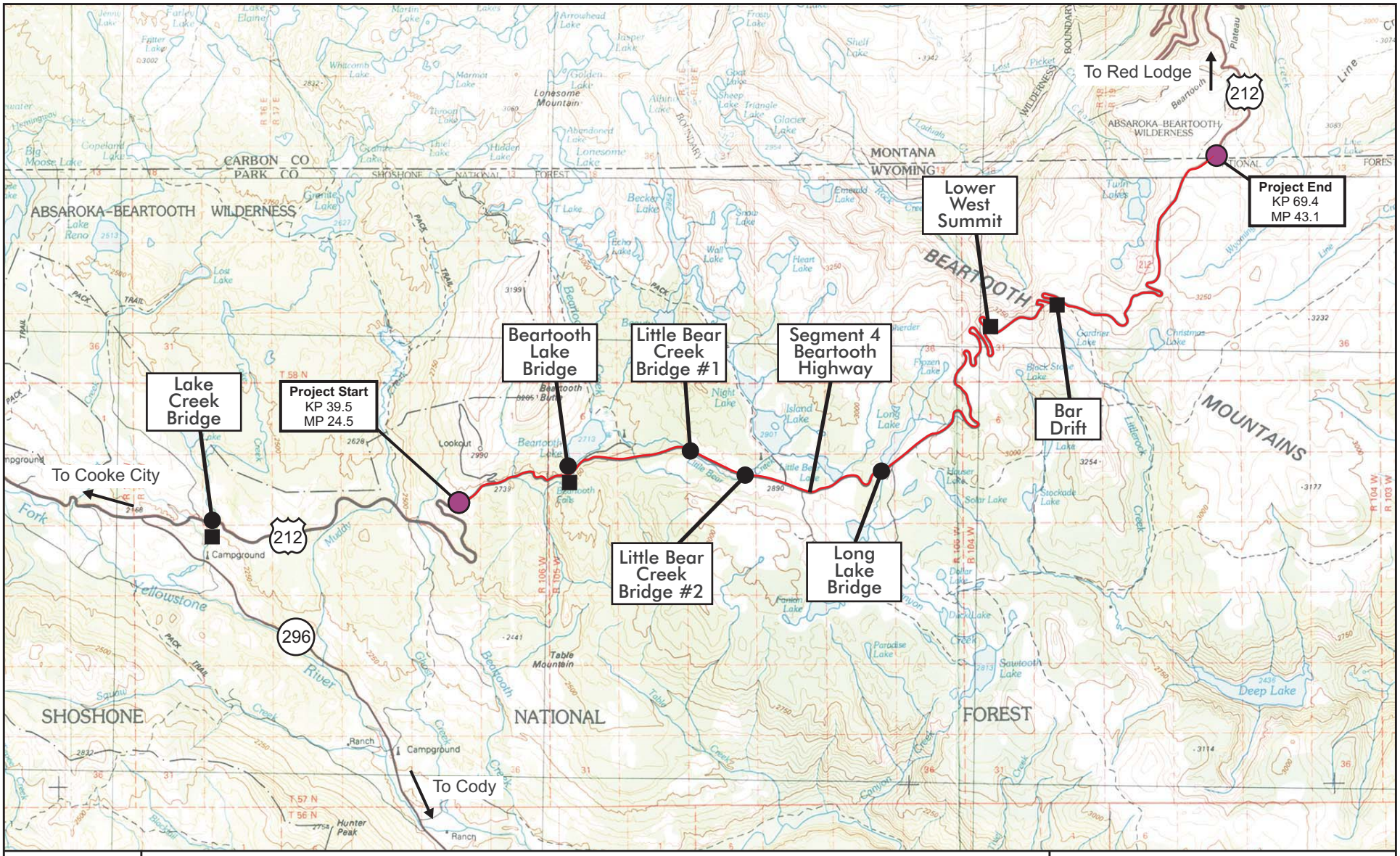
The road was constructed in the early 1930s and is eligible for listing in the National Register of Historic Places because it is a significant engineering accomplishment.

Traditional Cultural Properties are those cultural resources that are eligible for listing in the NRHP because they possess significance to tribal religious beliefs or practices and cultural affiliation. Examples relevant to the project area include locations associated with traditional beliefs of a Native American group, locations that Native American religious practitioners have historically used or are known to use today, or locations where a group has traditionally carried out economic, artistic, or other cultural practices.

Affected Environment

Historic and Prehistoric Resources

The project area was surveyed for cultural resources using standard survey methods approved by the FHWA, the SNF, the Wyoming State Historic Preservation Office (SHPO), and following the requirements of the Secretary of the Interior's Standards and Guidelines (Killam and Taylor 1999; Killam et al. 1999). The surveys documented five resources that FHWA determined were eligible for listing in the NRHP. One historic resource is Segment 4 of the Beartooth Highway (U.S. 212) and contributing elements (Figure 34). Four other resources are historic bridges: Beartooth Lake outlet bridge; Little Bear Creek bridge #1, west of the Top of the World Store; Little Bear Creek bridge #2, west of Island Lake Campground; and Long Lake outlet bridge (Figure 34). In addition, the Lake Creek bridge, west of Segment 4, would be used as a cultural resource mitigation site and is also eligible. No other known



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- Eligible Cultural Resource
- Proposed Cultural Resource Mitigation Site

1/2 Inch = 1 Mile

N

Figure 34
Cultural Resources Eligible for Listing in the National Register of Historic Places and Proposed Mitigation Sites

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known historic or prehistoric resources determined eligible for listing in the NRHP were identified in the project area. The Wyoming SHPO concurred with the eligibility determinations for the five resources (Wyoming SHPO 1999).

Segment 4 of the road is eligible for listing in the NRHP as a significant engineering accomplishment, conveyed primarily by the location and footprint of the roadway. It also is eligible because of its association with significant events in U.S. history. When the road was constructed in the 1930s, few other roads had been built that required the engineering solutions necessary for the topographic challenges presented by the landscape of the Beartooth Plateau. Several sections convey the engineering accomplishments of the era, such as the switchbacks in the eastern third of the project area, and the roadway alignment through the Beartooth Ravine.

Other features associated with the road include three culvert headwalls constructed of dry-laid masonry comprised of local granite blocks. The bridges and culvert headwalls are constructed of shaped stone and were built by contractors. Each bridge is eligible for listing in the NRHP because each represented an example of the period and style of construction.

Four bridges associated with the road, including Little Bear Creek Bridge # 1 above, also are eligible for listing in the National Register of Historic Places.

Traditional Cultural Properties

To determine if Traditional Cultural Properties exist within the project area, the following tribes and groups were notified: Medicine Wheel Coalition for Sacred Sites in North America, Crow, Northern Arapaho, Confederated Tribes of the Umatilla, Northern Cheyenne, Shoshone-Bannock, and Eastern Shoshone. The notification process began with a formal letter of contact and telephone follow-up between July and October 1999. Consultation between the FHWA and interested tribes is on-going. Response to these contacts indicated that there were no Traditional Cultural Property issues associated with the proposed project if the work is conducted within the area surveyed for cultural resources, and work is halted immediately if any potential sacred sites are located during construction-related activities. Physical evidence of sacred sites may consist of human remains or evidence of ceremonial activities. Some sacred sites, such as places where vision quests are sought, may not contain physical evidence. The Crow, Shoshone-Bannock, Eastern Shoshone, and Northern Cheyenne have requested that they be notified if any sacred sites are located. Because no Traditional Cultural Properties have yet been identified and by following the commitments discussed above, it is expected that the proposed project would not affect Traditional Cultural Properties. Therefore, they are not discussed further. The formal, government-to-government consultation process will continue, identifying and resolving any additional tribal concerns and issues.

Environmental Consequences

Effects of the No Action Alternative

In the short term, the No Action Alternative would not affect the characteristics that make the Beartooth Highway eligible for listing in the NRHP. The long-term effects of the No Action Alternative may adversely affect the road. Funding for road maintenance would remain uncertain, and in its current alignment, road deterioration would continue. If the road would continue to deteriorate, the integrity of the road would be adversely affected. In accordance with 36 CFR Part 800.5(a)(vi), "neglect of a property which causes it's deterioration" is considered an "adverse effect."

Similarly, the No Action Alternative would not have a short-term effect on the characteristics that make the four historic bridges eligible for listing in the NRHP. Over the long term, however, the bridges would continue to deteriorate, possibly until design elements and details would be compromised, or the materials could no longer be salvaged for use in subsequent bridge construction. Increased traffic volumes would also contribute to continued deterioration. If the bridges would continue to deteriorate, the integrity of the bridges would be adversely affected.

Effects of the Build Alternatives

Alternatives 3 through 6 would adversely affect Segment 4 of the road, and four historic bridges. Alternative 2 would adversely affect Segment 4 of the road, and three historic bridges. The Little Bear Creek bridge #2 would not be dismantled in Alternative 2, although it would no longer function as part of the roadway. The following sections describe the effects in more detail.

Changes to Segment 4. All build alternatives would alter the footprint of the roadway. The alternatives would include widening the roadway to 9.6 m (32 ft.), 9.0 (30 ft.), or 8.4 m (28 ft.), or a combination of these widths. The centerline in each build alternative would vary from the existing centerline in some locations, and all build alternatives would remove three of the four historic bridges. Dismantling the masonry culvert headwalls in all build alternatives would eliminate a feature associated with the historic road. The number of pullouts associated with each alternative would vary from existing conditions. Changes to the footprint of the road and number of switchbacks under each build alternative are summarized in Table 11.

Widening of the roadway would alter the existing footprint of the road, affecting the integrity of the design and workmanship characteristics. A repaving project was completed in the 1960s that added paved ditches in some locations.

Table 11. Changes in roadway width, Beartooth Ravine, pullouts and switchbacks of all alternatives.

Element	Alternative					
	1	2	3	4	5	6
Roadway width (m/ft.)	5.5/18	9.6/32	8.4/28	9.6/32	8.4/28	Multiple[†]
Switchbacks (#)	12	12	12	9	10	12
Beartooth Ravine	Road	Road	Road	Bridge	Bridge	Bridge
Pullouts (#)	114	78	36	62	31	66

[†]The roadway would be 9.0 m (30 ft.) west of the road closure gate, and 8.4 (28 ft.) east of the road closure gate. A short transition section from the project start to the Clay Butte Lookout turnoff would be 9.6 m (32 ft.) wide.

Consequently, the existing footprint does not represent the exact footprint as constructed in the 1930s. However, the work performed in the 1960s was not considered by the SHPO to be substantial enough to adversely affect those elements that make the road eligible for listing.

To minimize disturbance, all build alternatives would closely follow the existing centerline throughout most of the route. The road would be realigned at one or more locations in all build alternatives. Moving the centerline would adversely affect the road because the road location would be altered substantially from its original footprint. Alternative 3 has an alignment that would most closely follow the existing alignment; 1,705 m (5,594 ft.) of the alignment would be altered in four out of the five realignment areas (Table 12). Alternative 5 would have the longest length of alignment outside of the existing alignment—a total of 5,150 m (16,897 ft.)—at the five realignment areas. Table 12 shows the length of road where the construction limit of the new alignment would be more than 2.7 m (9 ft.) from the existing centerline at five realignment areas. Minor alignment shifts of less than 9 feet from the existing centerline would occur at a few other locations.

Three of the alternatives, Alternatives 4, 5 and 6, would eliminate the original feature of the Beartooth Ravine alignment with the construction of a new bridge (Table 11). The Beartooth Ravine alignment is one of the features for which the roadway is considered eligible due to the significant engineering feat of the road alignment. Alternative 4 would also involve adverse impact by removing sections of switchbacks at the Albright Curve and the Bar Drift. Alternatives 2 and 3 would not adversely affect the switchbacks or ravine sections, and the road would retain integrity of location, setting, feeling, and association at these locations in these alternatives.

One of the features of the road is three masonry culvert headwalls. Because the road would be widened, the culvert headwalls require dismantling, and the culverts replaced. The FHWA would use the existing masonry or similar stones to rebuild

Table 12. Length of new alignment outside areas of existing alignment in the five realignment areas.

Realignment Area	Alternative 2		3		4		5		6	
	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.
Beartooth Ravine	0	0	0	0	395	1,296	365	1,198	365	1,198
Top of the World Store	2,946	9,665	280	919	280	919	2,912	9,554	2,912	9,554
Frozen Lake	239	784	239	784	534	1,752	239	784	239	784
Bar Drift	698	2,290	698	2,290	1,146	3,760	1,146	3,760	698	2,290
Albright Curve	488	1,601	488	1,601	722	2,369	488	1,601	373	1,222
Total Realignment Length	4,371	14,340	1,705	5,594	3,077	10,096	5,150	16,897	4,587	15,048
Total Centerline Length	30,014	98,472	29,928	98,189	28,899	94,813	29,430	96,557	29,972	98,333

Lengths shown are in the five realignment areas. Minor alignment shifts would occur at a few other locations.
Alternative 1 would not change the existing alignment.

the headwalls. In some locations, stone form liner may be used in lieu of stone masonry if the volume or quality of the existing masonry and nearby rocks are not adequate. The *Proposed Mitigation* section discusses FHWA's plans to rebuild the culvert headwalls and bridge abutments.

The construction date of the 114 existing pullouts is not known because original construction plans detailing these pullouts for the road do not exist. Some pullouts date to the last major rehabilitation project conducted on the road in the 1960s, and some may have developed over the years. The build alternatives include various combinations of rehabilitating existing pullouts and constructing new pullouts, with the number of pullouts ranging from 31 to 78. All build options would have fewer pullouts than the existing road. Although retaining existing pullouts and adding new ones would change the existing footprint, the original association of these features with the road would be retained. Total pullouts by alternative are listed in Table 11.

Historic Bridges. All build alternatives except Alternative 2 would adversely affect four bridges (Beartooth Lake outlet bridge, Little Bear Creek bridge #1, Little Bear Creek bridge #2, and Long Lake bridge). Because the bridges are substandard and are deteriorating, the four original bridges in Alternatives 3 through 6 would be dismantled and new bridges constructed. See the *Bridge Construction Options* section in Chapter 2 (p. 90) for more information on other options that were considered.

In Alternative 2, the road would avoid Little Bear Creek bridge #2 and the bridge would not be dismantled. The bridge would be a "discovery site", a historic feature with no interpretation, including trails, parking lots, or other facilities. Alternative 2 would not adversely affect the structural integrity of Little Bear Creek bridge #2. However, once the bridge is removed from the highway alignment, its function would be lost, adversely affecting its integrity of setting. Maintenance of the bridge would be uncertain, and the bridge may eventually deteriorate to a point where physical integrity would be lost.

On the dismantled bridges and culvert headwalls, the original stone masonry would be salvaged. The FHWA would use the salvaged stone masonry or similar stone masonry to provide an aesthetic facing for the three culvert headwalls and new bridge abutments, except for the Beartooth Ravine bridge. It may be necessary to split the existing stone masonry in half to provide sufficient masonry for the new abutments. Any new unweathered masonry face would be placed in less visible locations. The visible portion of the facing would closely match the look of the stone masonry on the existing bridges. In some locations, stone form liner may be used in lieu of stone masonry if the volume or quality of the existing masonry and nearby rocks are not adequate. Although the facing on the bridge abutments would be constructed using salvaged historic materials or similar materials from the project area and would look similar to the original bridges, the bridges would not be historic. The Long Lake bridge would be constructed very near its original location, while the location of the other new bridges may be slightly different, depending on the alternative selected. The FHWA, in cooperation with the SHPO, would ensure that use of the Lake Creek bridge as a mitigation site would not adversely affect it. See the following *Proposed Mitigation* section for more information on the Lake Creek bridge.

Development of materials sources, staging areas and a workcamp would not adversely affect any prehistoric or historic resources. No prehistoric or

historic resources were identified at any location proposed for these project facilities.

Cumulative Effects. Implementation of any of the build alternatives would not cumulatively affect any cultural resources determined eligible for listing in the NRHP. Because Segment 1 of the Beartooth Highway was completely reconstructed in the 1950's, it no longer possesses the physical integrity associated with the original construction. However, the FHWA in consultation with the Montana State Historic Preservation Officer determined that Segment 1 "does retain intrinsic values of isolation and remoteness, scenery, and associative history." The Western Federal Highway Administration and the MTSHPO determined that the proposed reconstruction of Segment 1 would have an effect on these values though the effect is not necessarily adverse. To mitigate for this effect, the Western and Central Federal Highway Lands Divisions agreed to nominate the entire Beartooth Highway to the NRHP.

Resource Commitments. All build alternatives would require the irreversible commitment of the original footprint and location of the road, four historic bridges, and three culvert headwalls. The overall character of the road would be preserved by retaining the switchbacks that convey the engineering accomplishments and preserving the overall characteristics of setting, feeling, association, and location. Mitigation for all build alternatives would preserve the overall character of the bridges and culvert headwalls by salvaging and reusing original materials and by designing the replacements to match the originals as closely as is feasible. Once dismantled, the individual bridges and culvert headwalls could no longer be considered eligible for listing in the NRHP. In Alternative 2, the road would avoid Little Bear Creek bridge #2 and the bridge would not be dismantled. The bridge would remain eligible for listing in the NRHP. However, once the bridge is removed from the highway alignment, its function would be lost, adversely affecting its integrity of setting.

Proposed Mitigation

The FHWA, the SNF, the NPS, and the Wyoming SHPO, have developed a draft Memorandum of Agreement for mitigation of adverse effects to historic resources. The agencies are finalizing the Memorandum of Agreement, which will be included in the Record of Decision. Mitigation of effects on Segment 4 would include preparing a formal nomination package for the Beartooth Highway for listing to the National Register and documenting any section of the original alignment selected for realignment (see Table 12). This documentation would include photographs showing the original location, footprint, and setting of the sections. Mitigation also would include interpretation of the history and construction of the road, by installing interpretive kiosks at pullouts along the road, and providing other interpretive materials for visitors. Information about the bridges would be included in the interpretive materials.

Three sites are being considered for interpretation of the original road construction (Figure 34). One site at the top of the West Summit switchbacks would provide an overview of the switchbacks leading up to the west summit (see Appendix G). A second site at the Bar Drift would provide an overview of the switchbacks leading up to the east summit. The third site at Beartooth Lake would provide interpretation of the former historic bridge at the outlet of Beartooth Lake. Interpretive historical information may be combined with information on other aspects of the area, such as geology, wildlife, and natural history. The details of the interpretation and site-specific locations

would be developed by the FHWA in consultation with the Wyoming SHPO, the SNF, the NPS, and interested tribes.

Mitigation of effects to the four historic bridges and culvert headwalls would include detailed photo-documentation and drawings of the existing bridge features before they are dismantled. Documentation would be to Historic American Building Survey/Historic American Engineering Record standards. If Alternative 2 is selected, documentation would still be completed on the Little Bear Creek bridge #2, even though the bridge would not be dismantled. The SNF would not assume responsibility for maintenance of the bridge; long-term maintenance would be uncertain.

On the dismantled bridges and culvert headwalls, the original stone masonry would be salvaged. The FHWA would use the salvaged stone masonry or similar stone masonry to provide an aesthetic facing for the three culvert headwalls and new bridge abutments, except for the Beartooth Ravine bridge (Figure 36). It may be necessary to split the existing stone masonry in half to provide sufficient masonry for the new abutments. In some locations, stone form liner may be used in lieu of stone masonry if the volume or quality of the existing masonry and nearby rocks are not adequate. Bridge design would replicate the original bridges as closely as possible, given safety and construction requirements. The abutments for the Beartooth Ravine bridge would be formed to look like stone or covered with cultured stone, and the bridge would have railings similar to the other bridges.

As additional mitigation of effects to the bridges, the FHWA and the SNF would develop an interpretive site at the Lake Creek bridge (Figure 35). The site would provide information about the Lake Creek bridge as well as the other four bridges along the proposed project. The interpretation would be consistent with the Beartooth All-American Road Corridor Management Plan. The responsibility for maintenance of the Lake Creek site would be uncertain.

Figure 35. Lake Creek bridge.

The Lake Creek bridge crosses a series of rapids. The old Lake Creek bridge is in the foreground and the new bridge is in the trees in the background.

If previously unknown cultural resources are inadvertently discovered during construction, work would stop in the immediate vicinity until the resource can be evaluated in accordance with the National Historic Preservation Act by the FHWA. If it is determined that such resources are eligible for listing in the NRHP, the FHWA would conduct such mitigation measures that would be developed through consultation with the SHPO, the SNF, and interested Native American tribes.

References

Killam, D.G., and M.L. Taylor. 1999. Final Addendum to the Cultural Resources Survey Report, Wyoming Forest Highway (FH) 4, Beartooth Highway, Park County, Wyoming, Carbon County, Montana.

Figure 36. Visual simulation of proposed Beartooth Lake outlet bridge.

Existing Beartooth Lake outlet bridge.

Proposed reconstructed Beartooth Lake outlet bridge.

Killam, D.G., M.L. Taylor and T. Hoefer. 1999. Final Cultural Resources Survey Report, Portions of U.S. 212, the Beartooth Highway, Park County, Wyoming.

Wyoming State Historical Preservation Office. 1999. Letter to James Keeley, Federal Highway Administration. August 3.

3.5 WILDLIFE

Affected Environment

Wildlife Habitat Types

The Beartooth Highway is located within the 56,600-km^2 (21,800-mi.^{2}) Greater Yellowstone Area (GYA). The GYA encompasses YNP and surrounding National Forests and wilderness areas. The GYA is considered one of the largest relatively undisturbed temperate ecosystems in the world and supports a variety of habitats and wildlife.

The road transects several habitat types including alpine meadow, forest, mountain meadow, wet meadow, and shrubby grassland. (See following *Vegetation, Timber, and Old Growth Forest* section and Figure 39 for more information.) Each type provides shelter, forage, denning, and breeding habitat for a diversity of wildlife. Wildlife often use multiple habitat types seasonally or during various stages of their life cycle.

Found along the eastern 17 km (11 mi.) of the project area, alpine meadows are characterized by cold temperatures, a short growing season, high winds, and intense solar radiation. Low-growing grasses and forbs dominate this habitat type and rock outcrops and talus slopes are common. Animals found in alpine meadows include the yellow-bellied marmot, pika, vole, bighorn sheep, mountain goat, and pocket gopher. Elk and mule deer forage in alpine meadows during the summer. White-tailed ptarmigan are common alpine residents, and other seasonal birds include white-crowned sparrows, horned lark, rosy finch, and American pipit.

Forests of Engelmann spruce, subalpine fir, lodge-pole pine, and whitebark pine interspersed with mountain meadows border the road from near Clay Butte east to the transition with the alpine meadow habitat. The Fox Creek workcamp site also supports forested habitat. Forested areas provide habitat for large mammals including black bear, grizzly bear, mule deer, elk, mountain lion, and moose. Other animals found in forest and meadow habitat include lynx, bobcat, coyote, snowshoe hare, marten, porcupine, shrew, ermine, pine squirrel, and a variety of small mammals such as shrew, vole, and mice. Clark's nutcracker is a common bird foraging on whitebark pinecones and other coniferous tree seeds. Other forest dwelling birds include mountain chickadee, dark-eyed junco, golden-crowned kinglet, yellow-rumped warbler hairy woodpecker, boreal owl, gray jay, and pine grosbeak. Meadows support mountain bluebird, Lincoln's sparrow, red-tailed hawk, American kestrel, and prairie falcon.

Wet meadows, found adjacent to area drainages, provide habitat for muskrat, montane shrew,

Bighorn sheep frequent the alpine meadows of the Beartooth Plateau.

meadow vole, and western jumping mouse. Moose forage in shrubby wetland habitat. Birds that frequent riparian habitats include common snipe, American dipper, warbling vireo, Wilson's warbler, and northern harrier. Riparian and aquatic areas provide suitable habitat for amphibians such as western boreal toad, northern leopard frog, tiger salamander, spotted frog, and chorus frog. The spotted frog is the only sensitive amphibian species with a documented occurrence in the project area (Wyoming Natural Diversity Database [WNDD] 2001).

Shrub grasslands and montane meadows are present at the western end of the project, and the Ghost Creek material sources site. Wildlife at these lower elevation sites includes species similar to those found in mountain meadows. Additional mammals common to shrub grassland habitat include black-tailed jackrabbit, coyote, Wyoming ground squirrel, montane vole, and badger. During the 1999 resurfacing project, workers saw black bears near the Ghost Creek material sources site. Birds likely to use this habitat include sage grouse, green-tailed towhee, American robin, vesper sparrow, ferruginous hawk, and Virginia's warbler.

Suitable nesting habitat for migratory birds is present in shrub grasslands, meadows, forests, and riparian areas within the area of disturbance. No known nesting sites are adjacent to the road (Barker 2002).

Wildlife Crossing Areas

Field reviews with the SNF, USFWS, and FHWA identified all significant wildlife crossings in the project area (Figure 37). All of the significant wildlife crossings are concentrated in the western section of the project area, west of Beartooth Lake. Wildlife crossings occur where tree and shrub cover and slope are conducive to animal movement, and frequently follow drainages. Seven wildlife crossing areas, some with more than one specific crossing, were found in the wildlife crossing assessment area. These crossings likely are used by larger animals, such as deer, elk, and grizzly bear. Smaller animals such as ermine have much smaller home ranges and localized travel corridors that were not identified. A more detailed design analysis of each of the seven wildlife crossing areas can be found in the *Biological Assessment* (ERO Resources Corp. 2003). Currently no signs or interpretive areas are on Segment 4 to warn visitors of wildlife crossing areas and the potential for vehicle/animal collisions.

Both traffic speed and traffic volume affect the risk for vehicle/animal collisions, which generally occur at wildlife crossings. According to Gunther et al. (1998) in a study completed in YNP, speed was the primary contributing factor to vehicle/animal collisions. About 85 percent of road kills generally occur where the speed limit is greater than 75 km/h (45 mph). Current operating speeds within the wildlife crossing assessment area in the western section of the project average 67 km/h (42 mph). Traffic volume is another contributing factor to vehicle/animal collision risk. According to Ruediger et al. (2002), traffic volumes greater than 2000 vehicles per day are detrimental to wildlife connectivity. Currently, the Seasonal Average Daily Traffic (SADT) is about 942 for Segment 4, and is projected to be 1,972 by the year 2025. Traffic speed and volume also can contribute to wildlife habitat fragmentation. Fragmentation occurs when wildlife cannot or do not access previously used habitat because of various movement barriers. Barriers can include physical elements such as retaining walls or other factors such as increased traffic volume.

Threatened and Endangered Species

Three federally listed threatened or endangered species, one non-essential experimental species population, and two candidate species were identified by the USFWS as having habitat in the project area (Table 13; also see 2001 letter from USFWS in Appendix D). A brief description of threatened or endangered wildlife species with suitable habitat in the project area follows. The project area does not provide suitable habitat for four other species of concern in Wyoming—the whooping crane (endangered), black-footed ferret (endangered), mountain plover (proposed), or yellow-billed cuckoo (candidate) (USFWS 2001). These four species are not discussed. A more detailed description of threatened or endangered species is found in the *Wildlife Resources Final Report* (ERO Resources Corp. 2000a).

Grizzly Bear. The grizzly bear was listed as threatened in 1975 and a draft recovery plan for the species was first adopted in 1982 (USFWS 1993). The USFWS, in conjunction with other agencies including the SNF, is in the process of finalizing for the Grizzly Bear in the Yellowstone Ecosystem (Interagency Conservation Strategy Team 2003). The Conservation Strategy is intended to guide future management of the grizzly bear and its habitat if the bear is delisted, and this document was considered during selection of the preferred alternative.

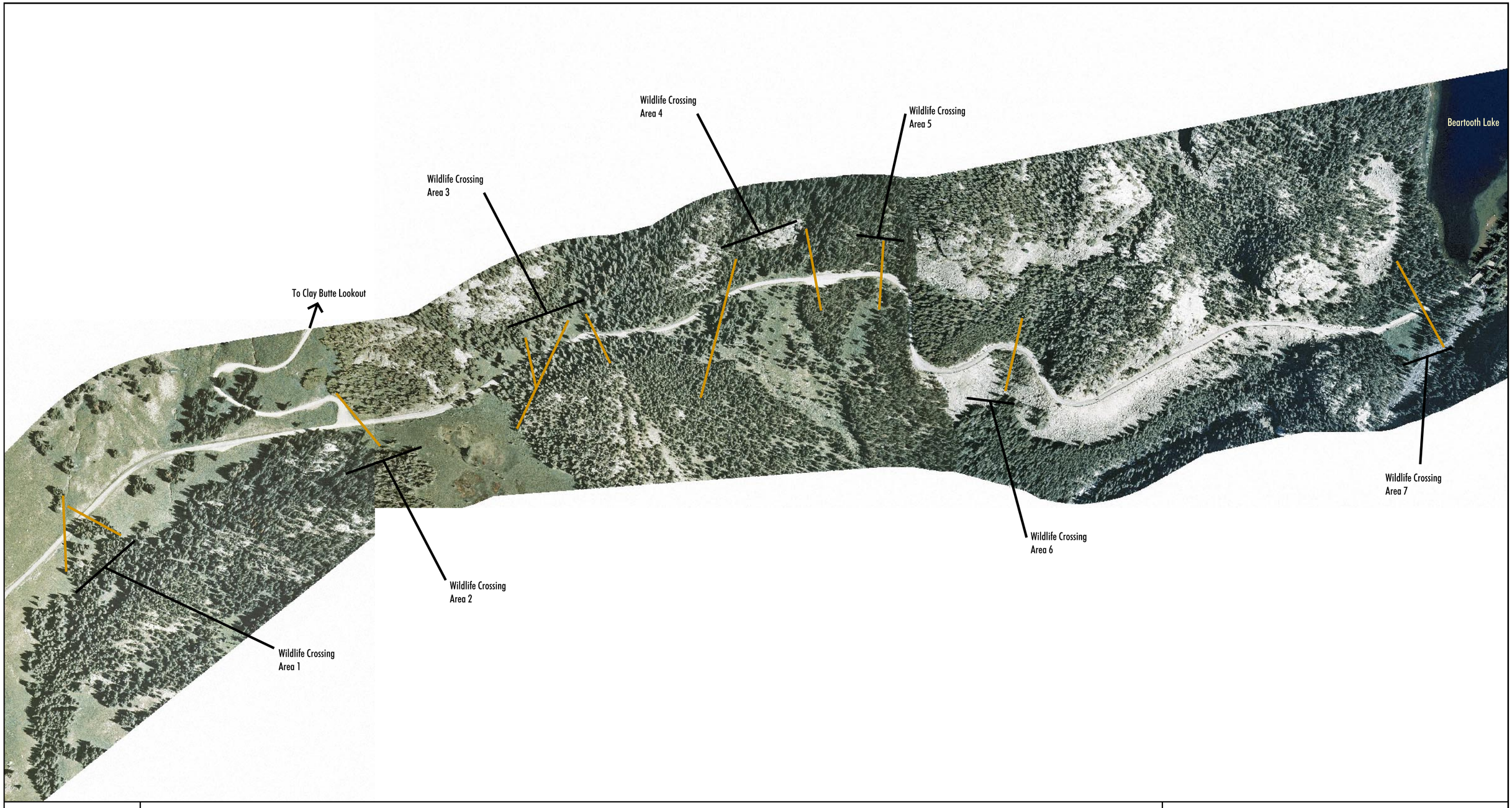
No critical habitat has been defined for the species. Populations of the grizzly bear occupy parts of British Columbia and Alberta in Canada, and Montana, Idaho, and Wyoming in the United States. The SNF and adjacent lands within the GYA provide important habitat to one of the largest populations of grizzly bears in the lower 48 states. Portions of the project area are located in the Yellowstone Grizzly Bear Recovery Zone. The Recovery Zone covers 24,000 km^2 (9,200 mi^2) surrounding YNP, and falls within Montana, Wyoming, and Idaho. It contains the seasonal habitat components needed to support a recovered population within the Yellowstone Area as defined by the Grizzly Bear Recovery Plan (USFWS 1993).

Grizzly bear recovery is documented and managed within the Grizzly Bear Recovery Zone through grizzly bear subunits and management situations. The Recovery Zone is divided into bear management units (BMU) that are further divided into subunits. BMUs and subunits are used to estimate the effect of various human activities on the bear. Portions of the project area fall within the Crandall-Sunlight BMU, and Crandall-Sunlight subunits 1 and 2.

Table 13. Threatened or endangered wildlife species with habitat in the project area.

Common Name	Scientific Name	Species Status	Record of Presence In or Near the Project Area
Grizzly bear	*Ursus arctos horribilis*	Threatened	✓
Canada lynx	*Felis lynx canadensis*	Threatened	✓
Bald eagle	*Haliaeetus leucocephalus*	Threatened	
Rocky Mountain gray wolf	*Canis lupus irremotus*	Non-essential experimental	✓
Arctic grayling[†]	*Thymallus arcticus*	Candidate	
Western boreal toad	*Bufo boreas boreas*	Candidate	

[†]Only the fluvial population is a candidate for federal listing.
Source: USFWS 2001.



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Wildlife crossing

0 60 120 Meters

Scale 1 inch = 150 meters

N

Figure 37
Wildlife Crossing Assessment Area

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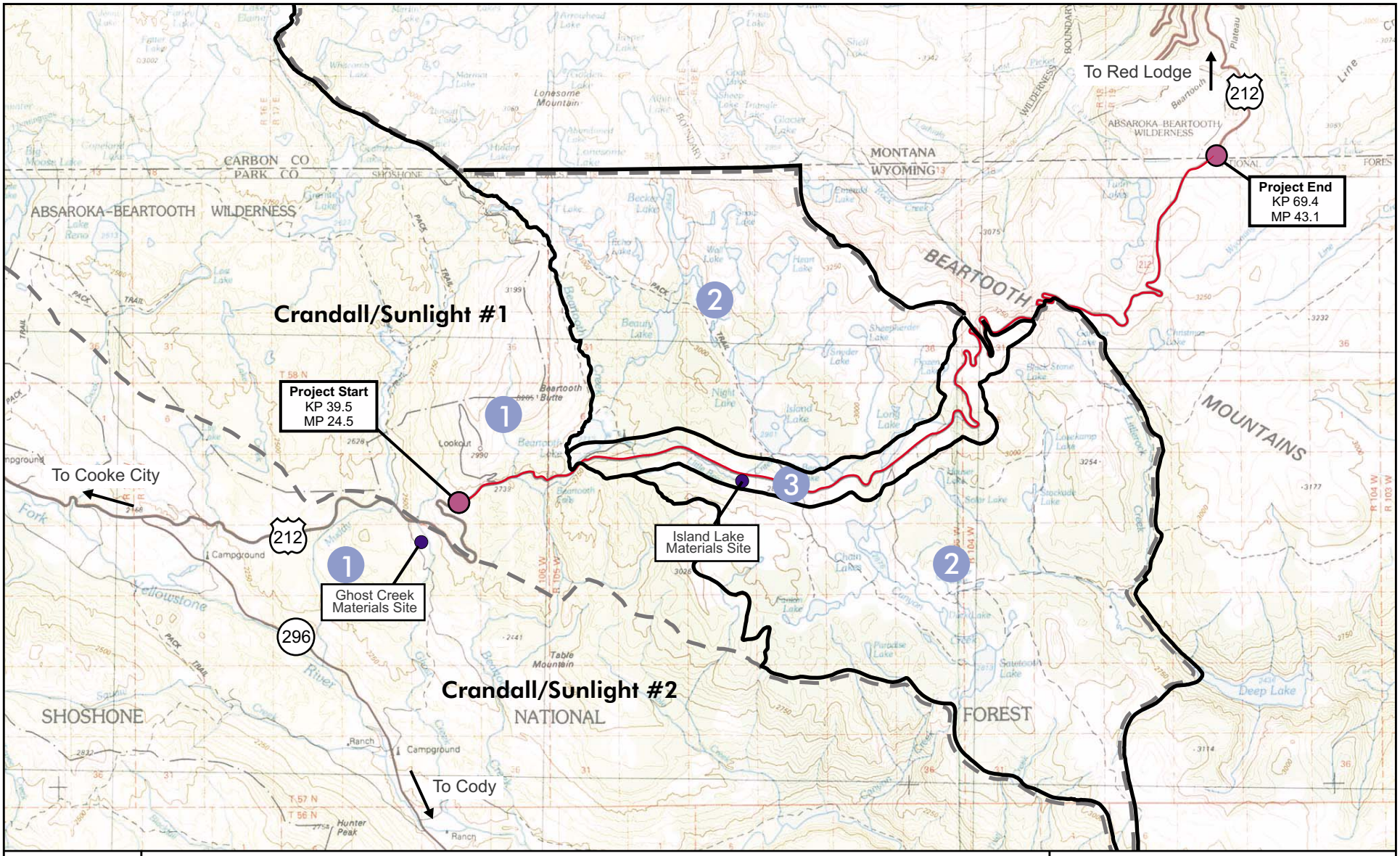
Management Situations (MS) define areas of bear management priority. Portions of the project area are located in MS1 and MS3 (Figure 38). Grizzly bear presence in MS3 lands is possible, but infrequent due to developments such as campgrounds, roads, trails, and other high human-use activities. The USFS manages MS3 areas to minimize potential bear/human conflicts. West of Beartooth Lake, the project area is in the MS1 category. MS1 areas contain grizzly population centers and habitat components needed for the survival and recovery of the species. USFS management of MS1 areas favors the needs of grizzly bears over other competing land use values. The management priority is to maintain and improve bear habitat while reducing human/grizzly bear conflicts. The preferred wetland preservation site is on private land and therefore has no MS designation.

The grizzly bear has a home range of 130 to 1,300 km^2 (50 to 500 $mi.^2$) and uses a diverse mixture of forests, moist meadows, grasslands, and riparian habitats (USFWS 1995). The grizzly bear is an opportunistic feeder that uses a wide variety of plant and animal food sources. Grizzly bears in the GYA have the highest percentage of meat consumption in their diet of any inland grizzly bear population (Hilderbrand et al. 1999). About 30 to 70 percent of the diet of the Yellowstone grizzly bear is from some form of meat. Meat comprises the greatest proportion of the diet of adult males. Meat is considered to be any form of animal matter including ungulates (deer and elk), fish, army cutworm moths and other insects, and small mammals (Barber 2001). Diet varies by season and available forage. Ungulates are especially important in the spring and fall (Knight et al. 1984; Mattson et al. 1991). Whitebark pine seeds are an important fall source of food of the Yellowstone grizzly bear (Mattson et al. 1991), and use of this food by the bear is positively associated with reproduction and survivorship of the population (Mattson and Reinhart 1994). Most pine seed consumption results from bears raiding red squirrel cone caches (Mattson and Jonkel 1990). Fish are not a major component of bear diets in the GYA.

Twenty-two different radio-collared bears have been monitored using habitats in Crandall/Sunlight subunit 1 and forty-two in Crandall/Sunlight sub-unit 2 from 1975-2000 (Figure 38). Four radio-collared bears (all adult females) have been relocated in subunit 1, and 12 (6 adult females) in subunit 2 from 1996-2000. Both subunits provide similar foraging opportunities for grizzly bears in the spring and summer. During the fall, subunit 1 potentially provides more opportunity for foraging on whitebark pine seeds, depending on annual cone production (Mattson 1999).

YNP has completed an annual summary of grizzly bear/human conflicts occurring in the Greater Yellowstone Ecosystem each year from 1992 to 2002. Each wildlife management agency submits records of bear/human incidents that occurred in its respective jurisdiction. Between 1992 and 2000, eighteen incidents have occurred in the Crandall/Sunlight BMU. Twelve of these incidents were associated with backcountry hunting; five were conflicts at private residences where bears caused property damage and/or received food rewards; and one incident was livestock depredation. No incidents of bears causing property damage or receiving food rewards at campgrounds, trailheads or dispersed camping areas in the subunit have been documented.



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- Bear Management subunit boundary
- Project start and end
- Materials source
- Bear Management Situation boundary
- 1 Highest Management Priority (Management Situation 1)
- 2 Variable Management Priority (Management Situation 2)
- 3 Lowest Management Priority (Management Situation 3)

Source: Shoshone National Forest 1999

1/2 Inch = 1 Mile

N

Figure 38
Grizzly Bear Management Situations and Bear Management Subunits

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No bear/vehicle collisions have been documented in the project or in the Crandall/Sunlight BMU. Bears have been observed traveling through campgrounds and other human use areas (Barber 2001).

Grizzly bear habitat in SNF was mapped by the USFS for use with the Yellowstone grizzly bear cumulative effects model (CEM). The CEM was designed to assess the inherent productivity of grizzly bear habitat and the impacts of human activities on bear use of that habitat (Weaver et al. 1986). This combination of inherent habitat capability, or "habitat value," and its impairment by humans is called "habitat effectiveness." The coefficients of productivity developed for assessing the habitat value are a partial accounting of the net digested energy obtained by Yellowstone grizzly bears from different habitats. These coefficients, derived from grizzly bear foraging patterns in the GYA, vary by season, region, and type of year (Mattson 1999).

Habitat effectiveness reflects the total or cumulative impacts of all human facilities and activities, including roads and campgrounds, in an area on the habitat value of the area. The CEM summarizes habitat value and habitat effectiveness by BMU subunit for each of four seasons. The seasons are spring (March 1 to May 15), estrus (mating season; May 16 to July 15), early hyperphagia (beginning of feeding in preparation for hibernation; July 16 to August 31) and late hyperphagia (intense feeding period in preparation for hibernation; September 1 to November 30).

Quality of vegetative forage, distance to forest/non-forest edge, security cover and availability, and types of available animal protein food sources influence the habitat value of a site. In the GYA, the highest habitat values are during the spring, estrus, and early hyperphagia seasons due to the presence of winter-killed ungulate carcasses and newborn ungulates, spawning cutthroat trout, and army cutworm moths. These food sources, however, are uncommon or absent in the project area. Highest habitat values for late hyperphagia in the GYA are found in areas of whitebark pine, which is found in the forested portion of the project area.

The CEM reduces the value of habitat to adjacent to human use areas by applying a reduction to buffers of various distances depending on the type and duration of the human activity. The basic premise of habitat effectiveness is that a bear's ability to effectively extract nutrients from a site is reduced proportional to the type and level of human activity at or near the site. For example, roads reduce habitat value for greater distances than foot trails. Similarly, the effectiveness of the habitat within a buffer is reduced more with higher levels of human activity. High-use roads (defined for the purposes of the CEM as greater than 20 vehicle disturbances per week) reduce habitat effectiveness more than low-use roads (defined for the purposes of the CEM as between 3 and 19 vehicle disturbances per week).

Except during the late hyperphagia season, nearly all areas adjacent to Segment 4 currently have low habitat effectiveness. Habitat effectiveness for each season in the project area is lower than the habitat value due to existing human activity on and adjacent to the highway. The level of human activity varies in the project area between the four bear seasons and directly affects habitat effectiveness. Recreation use is at its highest during the early hyperphagia season. Snowmobile use is moderate in the spring, as is the level of hunter activity in the late hyperphagia season. Human activity gradually increases in the project area during the estrus season. Habitat in the project area is least affected by human activity in the estrus

season and most affected by human activity in early hyperphagia (Barber 2001).

Canada Lynx. The Canada lynx was listed as threatened in 2000, and no critical habitat has been designated for the lynx. The Canada lynx is a nocturnal forest carnivore (Ruediger et al. 2000). Historically, the lynx was present in 15 northern states. Currently, resident populations are present in Alaska, Montana, Washington, Maine, and possibly Minnesota and Wyoming (USFWS 2000). Lynx habitat generally is described as climax boreal forest, with the term "climax" indicating a dense understory of thickets and windfalls (DeStefano 1987). Lynx habitat generally is divided into two ecological regions—southern boreal forests in the continental U.S. and northern boreal forests in Canada and Alaska (Aubry et al. 2000). The forests in the project area are southern boreal forests. Much of the forest cover in the project area is considered to be old growth, a classification that is near climax conditions and that provides suitable denning habitat for lynx (Pfister et al. 1977). The average home range for male lynx in southern boreal forests, including the project area, is 150 km^2 (58 $mi.^2$) and 73 km^2 (28 $mi.^2$) for females (Aubry et al. 2000). Large home ranges in the southern boreal forests are probably in response to the low density of snowshoe hare populations and habitat fragmentation.

Lynx denning habitat is typically found in late successional spruce/fir forests or mature lodgepole pine interspersed with other cover types (Squires and Laurion 2000). Windfall trees, large root masses, thick shrubs or evergreen cover provide the understory structure necessary to provide security and thermal cover for kittens (Koehler 1990; Aubry et al. 2000). Minimal human disturbance is an important feature of denning sites (Brittell 1989). Denning activity in the project area is unlikely due to the high level of existing human disturbance from roads, campgrounds, and trails.

Lynx feed where snowshoe hare, the lynx's primary prey, are present. Generally, earlier successional forest stages have greater understory structure than do mature forests and therefore support higher hare densities (Hodges 2000). The project area does not provide optimal hare habitat. Over 90 percent of the forest along the corridor is old growth forest. Lynx also feed on red squirrel, grouse and other small mammals (Aubry et al. 2000).

Lynx travel corridors are thought to be an important factor in lynx habitat because of their large home ranges (Brittell 1989). Landscape connectivity for lynx movement may include forested mountain ridges, wooded riparian drainages, and lower elevation forests and shrub habitat that serve to connect areas of important denning and feeding habitat. Travel corridors are usually forested and include contiguous vegetation cover over 2 m (6 ft.) in height (Brittell 1989). Lynx travel along the edges of meadows, but generally do not cross openings wider than 100 m (300 ft.) (Koehler 1990). However, the lynx has been recorded using open habitat and riparian areas surrounded by open habitat in Idaho (Terra-Berns and Lewis 1998) and large open expanses of shrub and mountain grasslands (Thompson and Halfpenny 1989).

Very little information is available for lynx populations on the SNF. Surveys in the past several years have not resulted in positive identification of lynx hair or prints (Barker 2002). Current and historical records for the lynx have been documented for the Yellowstone region, including the project area (Ruediger et al. 2000). Suitable lynx and snowshoe hare habitat is present in forested areas west of Beartooth Lake, and

coincides with the wildlife crossing assessment area (Figure 37) (USFS 2000a). The area between the project start at KP 39.5 and Little Bear Creek bridge #1 at KP 45 is a "key linkage area" for lynx (Barber 2001). Key linkage areas connect areas of suitable lynx foraging and denning habitat. A lynx observation is documented about 3.2 km (2 mi.) north of Long Lake (WNDD 2001).

Several factors have been identified that affect lynx productivity, ranging from timber management to recreational development. Lynx movement is affected by corridors, such as roads, railroads and utilities, and recreation uses, such as ski areas and resorts (Ruediger et al. 2000). Campground and trail use may fragment habitat and reduce connectivity. In effect, a reduction in connectivity results in habitat loss, because areas are no longer as accessible for use by lynx (Buskirk et al. 2000). Winter recreational activities that compact snow, such as concentrated snowmobiling and skiing, may reduce the competitive advantage that lynx have in deep snow and allow competition from coyotes, bobcats or other species that compete for food (Buskirk et al. 2000). Winter recreation takes place primarily west of Long Lake, and includes snowshoeing, skiing, and snowmobiling.

Roads can fragment habitat by creating physical and/or behavioral barriers to lynx movement and can result in direct mortality. Vehicular collisions can cause lynx mortality, with collision risk dependent on traffic volume and time of day, road width, and location in relation to suitable habitat (Aubry et al. 2000). The existing road has fragmented suitable lynx habitat to the north and south. Existing effects to lynx from the road are probably limited by the low traffic volume, minimal nighttime traffic, and seasonal road closure from fall until late spring. Studies show that 4,000 or more vehicles per day may increase mortality risk and habitat fragmentation (Ruediger et al 2000). Current and projected traffic levels (2025) are below this threshold (SADT 942 and 1,972, respectively). The USFWS (2000) determined roads that cross suitable habitat might adversely influence lynx movement and that high traffic volumes along with development inhibit lynx dispersal and movement within home ranges and may contribute to a loss of habitat connectivity. There are no known lynx/vehicle collisions in the project area. Transplanted lynx have a higher risk of vehicle collision mortality (Aubrey et al. 2000), but no transplanted lynx are known to occur in the project area.

Rocky Mountain Gray Wolf. The Western distinct population segment of the gray wolf was listed as endangered in 1974. Gray wolves were reintroduced to YNP beginning in 1995. Due to population recovery, the Western distinct population segment of the gray wolf was down-listed to threatened in 2003. All gray wolves within Wyoming are currently considered part of a nonessential experimental population. Although such wolves remain listed and protected under the Endangered Species Act, additional flexibility is provided for their management under provisions of the final rule and special regulations promulgated for the nonessential experimental population on November 22, 1994 (59 FR 60252). Requirements for interagency consultation under section 7 of the Act differ based on the land ownership and/or management responsibility where the wolf occurs. All lands along Section 4 of the Beartooth Highway are National Forest System lands managed by the SNF. Therefore, all gray wolves present in the project area are treated as a nonessential experimental population under the Act.

Wolves are wide ranging species whose distribution is tied primarily to its principal prey—elk, deer, bison, and moose. In 2002, 271

and 23 breeding packs of gray wolves were known in the GYA, most of which were in YNP. The Beartooth Pack currently is the closest wolf pack to the project area, frequenting an area north and south of the Beartooth Highway in Wyoming. The pack formed in 2000. In late 2002, the Beartooth Pack consisted of four adults and three pups (USFWS et al 2003). Because the wolf is a wide-ranging species, individuals from the Beartooth pack may travel, den, or rendezvous near the project area.

Bald Eagle. The bald eagle was listed as an endangered species in 1978, and was downlisted to threatened in 1995. In 1999 the USFWS issued a Proposed Rule to Remove the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife (64 Fed. Reg. 36454 (July 6, 1999)). A final rule has not been issued for delisting the bald eagle.

Bald eagles prefer to nest in large trees near open water and/or riparian habitats. Wintering bald eagles use habitat similar to nest sites for establishing daytime perches near feeding areas (Harmata and Oakleaf 1992). The bald eagle is present in YNP, but suitable nesting or wintering habitat is not found in the project area. Bald eagles occasionally may migrate through the project area on the way to breeding or wintering habitat.

Arctic Grayling. The project area contains no native populations of fluvial (river) arctic graylings. The Wyoming Game and Fish Department has introduced hatchery-reared adfluvial (lake) arctic graylings into Bear Lake, which have dispersed into Beartooth Creek (McKnight 2001). The adfluvial arctic grayling is a distinct population from the fluvial arctic grayling. Only the fluvial arctic grayling is a candidate for federal listing.

Western Boreal Toad. The boreal toad, a candidate for federal listing, ranges from the mountainous portions of Colorado to the Pacific Northwest and as far north as southeast Alaska. Preferred habitat includes wet meadows, marshes, and the margins of beaver ponds and lakes (Hammerson 1999). The boreal toad has been documented in Yellowstone National Park, but it is not common (Koch and Peterson 1989). Although once common in the SNF, the boreal toad appears to be rare or absent from much of its former range (Garber 1994; 1995a). Surveys in 1994 found two boreal toad sites in the northern half of SNF (Garber 1995b). The boreal toad also is recorded in the Swamp Lake area south of the project area (Wyoming Natural Diversity Database 2001). The numerous wetlands, ponds, and small pools in the project area provide suitable habitat for the boreal toad, but there are no documented occurrences.

Forest Service Sensitive Species

Forest Service sensitive species identified by the SNF in Wyoming and GNF in Montana are discussed in this section. The project area is in the SNF, and a wetland mitigation site is adjacent to the GNF.

Eight Forest Service sensitive species have known occurrence records in or near the project area and suitable habitat exists for 19 additional species (USFS 1998) (Table 14). In addition, the GNF in Montana has one sensitive species, the peregrine falcon, with potential for occurrence in the project area (USFS 2000b). Population viability is a concern for sensitive species because of a significant current or predicted downward trend in population numbers and density or habitat capacity.

Sensitive species recorded near the project area include water vole and dwarf shrew, which are found in subalpine and alpine habitats; osprey and peregrine falcon, which feed and nest along rivers

and streams; spotted frog, which is found in riparian habitat including sites near Long Lake; and Yellowstone cutthroat trout, which is stocked in Long Lake and Beartooth Lake. Suitable habitat for other Forest Service sensitive species is found in forested areas, mountain meadows, riparian areas, and lakes throughout the project area.

Additional information on sensitive species is found in the *Wildlife Resources Final Report* (ERO Resources Corp. 2000a).

Management Indicator Species

The SNF designates management indicator species to monitor habitat suitability and wildlife diversity (Table 15). The three categories of management indicator species for the SNF are:

- Featured species—those that are hunted, fished, or trapped
- Recovery species—those that are state or federally threatened or endangered
- Ecological indicator species—those that are dependent on specific habitat characteristics or are sensitive to habitat change

All of the featured big game species, including moose, elk, mule deer, mountain goats, and bighorn sheep, are present in the project area. Moose forage in willow and herbaceous meadows from spring through fall. Deep snow limits their occupancy in the project area during the winter. Moose forage in wetlands and frequently are seen at a wetland complex across from the Clay Butte Lookout turnoff. Spring, summer, and fall ranges for elk and mule deer are found throughout the project area. Winter deer and elk ranges are located at lower elevations outside of the project area. Elk and deer movement to and from winter range does not occur along specific migration routes, but is a general pattern of movement between higher and lower elevations. Mountain goats

The elk is a SNF designated management indicator species.

are summer and fall residents of subalpine and alpine habitats in the project area. Bighorn sheep winter range, critical winter range, and year-round range are found at higher elevations in the project area. The grizzly bear, gray wolf, and lynx are the only recovery species with documented occurrences near the project area. Bald eagles may migrate occasionally through the project area.

Although rock outcrops suitable for peregrine falcon nesting are present in several locations along the road, there are no records of peregrine breeding activity in the project area (Montana Natural Heritage Program [MNHP] 2001; Barber 1998). The closest known peregrine falcon nest sites to the project area are in the Clarks Fork Canyon, about 16 km (10 mi.) to the south (Barber 1998). Suitable peregrine nesting habitat is not present at the preferred wetland mitigation site. Peregrines may forage in the area and have been recorded in the Cooke City Basin (USFS 2000c).

Table 14. Forest Service sensitive species with habitat in the project area.

Common Name	Scientific Name	Record of Presence In or Near the Project Area
Mammals		
Spotted bat	*Euderma maculatum*	
North American wolverine	*Gulo gulo luscus*	✓
Marten	*Martes americana*	✓
Fisher	*Martes pennanti*	✓
Water vole	*Microtis richardsoni*	✓
Fringed-tailed myotis	*Myotis thysanodes pahasapensis*	
Townsend's big-eared bat	*Plecotus townsendii*	
Dwarf shrew	*Sorex nanus*	✓
Birds		
Northern goshawk	*Accipeter gentilis*	✓
Boreal owl	*Aegolius funereus*	
Baird's sparrow	*Ammodramus bairdii*	
Olive-sided flycatcher	*Contopus borealis*	
Trumpeter swan	*Cygnus buccinator*	✓
Merlin	*Falco columbarius*	
Peregrine falcon	*Falco peregrinus*	
Common loon	*Gavia immer*	
Harlequin duck	*Histrionicus histrionicus*	
Osprey	*Pandion haliaetus*	✓
Fox sparrow	*Passerella iliaca*	
Black-backed woodpecker	*Picoides arcticus*	
Northern three-toed woodpecker	*Picoides tridactylus*	
Golden-crowned kinglet	*Regulus satrapa*	
Pygmy nuthatch	*Sitta pygmaea*	
Reptiles and Amphibians		
Tiger salamander	*Ambystoma tigrinum*	
Northern leopard frog	*Rana pipiens*	
Spotted frog	*Rana pretiosa*	✓
Fish		
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*	✓

Source: USFS 1998, 1999; Wyoming Game and Fish Department 1997; WNDD 2001.

Table 15. SNF management indicator species with habitat in the project area.

Common Name	Scientific Name	Record of Presence In or Near the Project Area
Featured Species		
Moose	*Alces alces*	✓
Elk	*Cervus elaphus*	✓
Mule deer	*Odocoileus hemionus*	✓
Mountain goat	*Oreamnos americanus*	✓
Bighorn sheep	*Ovis canadensis*	✓
Recovery Species		
Gray wolf	*Canis lupus ireemotus*	
Peregrine falcon	*Falco peregrinus*	✓
Bald eagle	*Haliaeetus leucocephalus*	
Grizzly bear	*Ursus arctos horribilis*	✓
Lynx	*Felis lynx canadensis*	✓
Ecological Indicator Species		
Northern goshawk	*Accipiter gentilis*	✓
Ruffed grouse	*Bonasa umbellus*	
Beaver	*Castor canadensis*	
Blue grouse	*Dendragapus obscurus*	
Marten	*Martes americana*	✓
Hairy woodpecker	*Picoides villosus*	
Brewer's sparrow	*Spizella breweri*	

Source: SNF 1986.

Northern goshawks and pine martens are the only ecological indicator species with known historical presence near the project area. Forested areas in the project area provide suitable habitat for pine martens, blue grouse, and hairy woodpeckers. Shrub grasslands in the western portion of the project area including the Ghost Creek material sources site provide suitable habitat for Brewer's sparrow. The project area contains several streams suitable for use by beaver, but deciduous trees for beaver use are limited. The project area provides limited habitat for ruffed grouse due to the lack of large areas of aspen or deciduous forest.

Other Species of Concern

Several state species of concern identified by the Wyoming Natural Diversity Database (WNDD 2001) and Montana Natural Heritage Program (MNHP 1999) have potential for occurrence near the project area. Long-billed curlews are known to occur in prairie habitats at lower elevations. Ring-billed gulls are generally found at lower elevation ponds and reservoirs, but may occasionally use habitat in the project area. Suckermouth minnows are found in shallow streams high in organic matter, generally at elevations below the project area. Uinta chipmunks are a Montana species of

concern with suitable habitat at the preferred wetland mitigation site.

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not disturb existing habitat or cause additional loss of wildlife habitat. The existing road, traffic, and recreation activities in the project area would continue to affect wildlife movement and activity. Wildlife habitat, including lynx habitat, would remain fragmented by the existing road and current recreation activity. Occasional wildlife mortality from collisions with vehicles would continue. Traffic volumes and recreation activity in the project area are expected to increase regardless of road improvements, which may affect wildlife habitat use and activity.

Effects of the Build Alternatives

Habitat Types and General Wildlife. The road widening and realignments associated with each build alternative would temporarily and permanently disturb wildlife habitat. Impacts within the limits of construction include both short-term disturbances that would be reclaimed with native vegetation following construction and long-term disturbances, and a direct long-term loss of habitat would occur within the footprint of the new road.

Short-term impacts on wildlife habitat within the limits of construction disturbance range from about 69 ha (172 ac.) for Alternative 3 to 78 ha (193 ac.) for Alternative 2 (Table 16). Alternative 2 would have the greatest impact on habitat because of the construction of a 9.6-m (32-ft.) wide road throughout the corridor, the greatest number of pullouts, and a realignment near the Top of the World Store. Alternatives 3 and 5, which would have a roadway width of 8.4 m (28 ft.) would have the least impact on habitat. Alternatives 4 and 6 would have impacts greater than Alternatives 3 and 5, but less than Alternative 2.

Following construction, areas within the construction limits that are unpaved, as well as abandoned road sections, would be revegetated. All foreslopes and cut and fill slopes would be revegetated. Wildlife crossing areas would receive site-specific revegetation treatment, as discussed in the *Wildlife Crossing Areas* section. In the short term, habitat quality of revegetated areas would be lower than existing habitat. Over the long term, habitat quality of revegetated areas would be similar to existing habitat. In some areas, such as alpine meadows, it may be 10 or more years before revegetated areas

Table 16. Wildlife habitat disturbed by road construction.

Habitat Type	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Alpine meadow	0	0	28	68	26	63	26	66	24	60	27	66
Mountain meadow	0	0	15	37	13	33	15	37	16	39	17	42
Wet meadow	0	0	4	10	4	9	4	10	3	8	3	8
Subalpine and montane forest	0	0	15	38	12	29	13	31	13	31	13	33
Shrub grassland	0	0	11	28	11	28	11	28	11	28	11	28
Rock outcrop/talus	0	0	4	10	4	9	4	10	4	9	4	10
Total	0	0	78	194	71	176	74	183	73	180	76	187

have similar habitat quality to existing habitat. Paved areas, such as the road pavement, pullouts, and road intersections, would result in a long-term loss of habitat. The long-term loss in wildlife habitat would range from about 19 ha (47 ac.) for Alternative 3 to 22 ha (55 ac.) for Alternatives 2 and 4 (Table 17).

For all build alternatives, alpine meadow habitat would be most affected (Table 17). Alpine habitat is the least productive for wildlife use because of the short growing season and harsh environment. The long-term loss of forestland by paved areas would range from 2 ha (6 ac.) for Alternative 3, to about 3 ha (7 ac.) for all other build alternatives. In addition to the loss of forested areas from a widened road, some forested areas adjacent to the road would be kept clear of trees. About 50 percent of cleared forestland would be converted permanently to grassland communities. For example, 13 ha (33 ac.) of forest would be cleared in Alternative 6 (Table 16), with 3 ha (7 ac.) permanently lost. Of the remaining 11 ha (27 ac.), about 5.5 ha (13.5 ac.) would be revegetated using tree species. Trees from adjacent undisturbed areas also would spread to the disturbed slopes. The other 5.5 ha (13.5 ac.) would be reseeded with grasses and kept cleared of trees. There would be a long-term conversion of 5.5 ha (13.5 ac.) to grassland.

About 11 ha (28 ac.) of shrub grasslands would be disturbed at the Ghost Creek materials site. The materials site would be reclaimed and reseeded following completion of road construction.

Road widening in all build alternatives would result in the direct loss of suitable foraging, nesting, and denning habitat for wildlife. Much of the habitat disturbance or loss would occur within areas of previous disturbance adjacent to the existing road, which normally experience low wildlife use. Abandoned road sections would be revegetated with native species and long-term productivity would be similar to undisturbed areas. If a migratory bird nest is identified prior to construction, attempts would be made to remove the inactive nest during the non-breeding season. All actions taken would comply with the Migratory Bird Treaty Act.

A wider road would increase habitat fragmentation and the travel distance for wildlife crossing the road. Alternatives 2, 4, and the western portion of Alternative 6 have a road width of 9.6 m (32 ft.) or

Table 17. Wildlife habitat permanently affected.

Habitat Type	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Alpine meadow	0	0	8	20	7	18	8	22	7	18	7	17
Mountain meadow	0	0	4	9	3	6	3	8	4	9	4	10
Wet meadow[§]	0	0	2	4	2	4	2	4	1	3	2	4
Subalpine and montane forest	0	0	3	8	2	6	3	7	3	7	3	7
Shrub grassland	0	0	0	0	0	0	0	0	0	0	0	0
Rock outcrop/talus	0	0	1	4	1	3	2	4	1	3	1	3
Total*	0	0	18	45	15	37	18	45	16	40	17	41

[§] See *Wetlands and other Waters of the U.S.* section for more details.

*Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.

9.0 (30 ft.) and would have a greater impact than Alternatives 3 and 5, which have a 8.4 m (28 ft.) road width. Widening the existing road may impact species dispersal and connectivity, as animals may be reluctant to cross a wider road. For all build alternatives, the risk for wildlife/vehicle collisions may increase, but is expected to remain low because the reconstructed road would retain its curvilinear nature and operating speeds would remain low (50 to 75 km/h [30 to 45 mph]). Traffic volumes, which are another factor in wildlife/vehicle collisions, would remain low (1,972 average vehicles per day projected for 2025). In a study in YNP, vehicle speed was found to be the primary factor contributing to vehicle/wildlife collisions (Gunther et al. 1998). Road design was found to be more important than posted speed limits in controlling vehicle speeds. Vehicle speeds on winding roads typically were near posted speed limits in YNP. The study also determined that about 85 percent of road kills occurred where the speed limit was greater than 75 km/h (45 mph). All build alternatives would have design speeds less than 75 km/h (45 mph).

New retaining walls may pose a barrier to wildlife movement in four areas: the Beartooth Ravine, Top of the World Store, at Little Bear Creek bridge #1, Long Lake bridge and at the west summit switchbacks. The Beartooth Ravine area would have about 420 m (1,380 ft.) of retaining wall for Alternatives 2 and 3, and about 230 m (750 ft.) of retaining wall for Alternatives 4, 5, and 6. Retaining wall at the Beartooth Ravine would have the greatest potential to affect wildlife movement because of the forested cover present at the ravine. Some wildlife species, particularly the lynx, prefer to travel in forested areas (Ruediger et al. 2000). The Beartooth Ravine area is a potential key lynx linkage area, and likely serves as a travel corridor for other species (USFS 2000a). However, most retaining wall sections at the ravine would be in steep areas where wildlife movement is already restricted. The retaining walls used in Alternatives 2 and 3 may impede wildlife travel across the road where travel corridors are present. The construction of bridges where travel corridors are present in Alternatives 4, 5 and 6 would allow wildlife movement.

Retaining walls would be constructed on both sides of Little Bear Creek bridge #1 in Alternatives 3 and 4. The retaining walls would be about 320 m (1,050 ft.) in length. The retaining walls may impede wildlife movement adjacent to the bridges, but wildlife would be able to pass under the bridge on dry land on both sides of Little Bear Creek, or to cross the road east and west of the bridge beyond the retaining walls.

All build alternatives would have retaining walls at the Long Lake bridge. The impact to wildlife movement would be similar to the impacts from Little Bear Creek bridge #1, with wildlife passage under the bridge or across the road east and west of the bridge beyond the retaining walls.

Retaining walls also would be built at the west summit switchbacks in alpine meadow habitat. Wildlife movement in these areas is already limited by the steep terrain and probably would not be affected further by retaining wall construction.

The area in which wildlife potentially would be affected by various disturbances, such as noise, would extend beyond the edge of the existing road and would vary with topography, vegetation type, and human activity. The area surrounding the existing road already is affected by traffic and recreation activity. The wider road resulting from all build alternatives would expand this area of wildlife impact, but would not change substantially from existing conditions because the majority of the road improvements occur within the existing

area of influence. Alternatives that include new alignments would slightly shift the zone of influence, but would fall within the existing road corridor. Alternatives 2, 5, and 6, which include a realignment (Option A or Option B) near the Top of the World Store, would result in the greatest change from the current alignment. Both options would extend the zone of influence into forest habitat north of the existing road, and may affect wildlife using these forested areas. Either option is not expected to have an adverse indirect effect on wildlife because the area already is impacted by human activity at Top of the World Store and Island Lake Campground, which is located 150 m (500 ft.) north of the realignment. Revegetation of the abandoned section of road south of the Top of the World Store would benefit wildlife favoring meadow and riparian habitat.

Indirect impacts on wildlife may occur if traffic and recreational activity along the road corridor increase. Traffic is projected to increase about 3 percent annually regardless of the alternative. Indirect additional recreation, such as hiking on backcountry trails, camping, and fishing activities, may displace wildlife or alter their behavior.

Temporary impacts on wildlife would occur during construction for all build alternatives. Some wildlife species would avoid construction areas due to the noise from equipment, blasting, and human activity. Temporarily displaced wildlife are expected to return after construction ends. Wildlife activity or movement during the winter (November to April) would not be affected because no road construction would take place during those months.

Wildlife Crossing Areas. Site-specific landscaping plans have been developed for the seven wildlife crossings identified in the western portion of Segment 4. Design modifications at wildlife crossing areas include changes to cut and fill slopes, centerline location, blasting and hauling schedule, and pullouts and parking areas. For example, a proposed pullout was eliminated at a wildlife crossing. Fill slopes were adjusted to minimize guardrail at the crossings. The wildlife crossings would be seeded with one of three seed mixes depending on location. Trees and shrubs would be planted to increase security cover to facilitate safe wildlife crossing. Additional details about the design at wildlife crossing areas can be found in the *Biological Assessment* (ERO Resources Corp. 2003).

Threatened and Endangered Species. Potential impacts on threatened and endangered species are similar for all build alternatives. Grizzly bear, lynx, gray wolf, and boreal toad may be affected by all of the build alternatives. The bald eagle would not be affected. The FHWA submitted a Biological Assessment to the USFWS and a Biological Evaluation to the SNF.

Grizzly Bear. All build alternatives may directly and indirectly affect grizzly bears. Potential direct impacts include loss of foraging habitat and security cover, impacts to the prey base, mortality, and temporary disturbance associated with human activity during construction. Design modifications at the wildlife crossing areas (discussed previously in the *Wildlife Crossing Areas* section) would help minimize grizzly bear impacts. In addition, signage and interpretation proposed for the project would inform visitors of wildlife crossing areas and grizzly bear habitat and movement. The contractor would be required to prepare and enforce a Grizzly Bear Management and Protection Plan, with guidance from the SNF and USFWS, to minimize impacts to the grizzly bear during construction.

All build alternatives would have a direct short-term effect on grizzly bear foraging habitat. More than 80 percent of direct impacts on grizzly bear

habitat would occur within MS3, where grizzly bear activity is less common (Figure 38). Construction disturbance (road and material sources) within MS1, which is managed to favor grizzly bears, would be similar for all build alternatives, ranging from 17 to 18 ha (43 to 45 ac.) (Table 18).

Long-term loss of grizzly bear habitat would occur for all build alternatives from road widening and additional paved surface. No change in road density would occur with implementation of any build alternative. Most of the disturbance would be in MS 3 habitat (Table 19). The permanent loss of grizzly bear habitat would range from about 7 ha (17 ac.) for Alternative 3 to about 10 ha (24 ac.) for Alternative 2 (Table 20).

Except during the late hyperphagia season, nearly all disturbed areas have low habitat effectiveness. For example, in Alternative 6 during the estrus season, 7 ha (18 ac.) of disturbance would be in areas with low habitat effectiveness. No areas of high habitat effectiveness would be disturbed during the estrus season in any build alternative. In the late hyperphagia season, about 50 percent of the disturbed area has low habitat effectiveness. The loss of grizzly bear habitat adjacent to the existing road corridor is unlikely to adversely impact the grizzly bear population because of the bear's limited activity near the road.

The clearing of whitebark pine forest would remove a food source frequently used by grizzly bears. Because whitebark pine requires 80 years to produce mature cones that have nutritional value for the bear, all impacts to whitebark pine would be considered permanent impacts. Long-term impacts on whitebark pine habitat would range from 7 ha (16 ac.) for Alternative 3 to 10 ha (24 ac.) for Alternative 2 (Table 21). The loss of whitebark pine forest would reduce the availability of a food source in the late summer and fall. Some of the affected whitebark pine forest in the project area is located in rocky subalpine habitat where seed production and habitat value are low.

No known grizzly bear den sites are near the project area and none of the build alternatives would affect suitable den sites. Tree removal on the western portion of the road would reduce grizzly bear hiding and security cover in all build alternatives. Site-specific landscaping treatments at the wildlife crossings would minimize impacts to grizzly bear movement patterns.

Table 18. Grizzly bear habitat temporarily affected by road construction (within construction limits) or material sources.

Alternative	MS 1 Habitat		MS 3 Habitat	
	ha[†]	ac.	ha	ac.
1	0	0	0	0
2	18	45	34	85
3	18	44	28	69
4	18	45	31	76
5	17	43	31	77
6	18	44	32	79

[†]Discrepancies may occur in the conversion of hectares to acres due to rounding.

Table 19. Grizzly bear habitat permanently affected.

Alternative	MS 1 Habitat		MS 3 Habitat	
	ha[†]	ac.	ha	ac.
1	0	0	0	0
2	2	4	8	20
3	1	3	6	14
4	2	4	7	16
5	1	3	7	17
6	2	4	7	17

[†]Discrepancies may occur in the conversion of hectares to acres due to rounding.

Table 20. Area of grizzly bear habitat permanently affected.

Habitat Effectiveness Values by Season[†]	Alternative											
	1		2		3		4		5		6	
	ha[§]	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Total (by season below)	**0**	**0**	**10**	**24**	**7**	**17**	**8**	**20**	**8**	**20**	**8**	**21**
Spring Season (March 1 to May 15)												
Low	0	0	10	23	7	16	7	19	8	20	8	21
Medium	0	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
High	0	0	0	0	0	0	0	0	0	0	0	0
Estrus (May 16 to July 15)												
Low	0	0	8	20	7	14	6	17	7	17	7	18
Medium	0	0	2	4	1	3	2	3	1	3	1	3
High	0	0	0	0	0	0	0	0	0	0	0	0
Early Hyperphagia (July 16 to August 31)												
Low	0	0	8	20	6	13	6	16	6	16	6	17
Medium	0	0	2	4	2	4	2	4	2	4	2	4
High	0	0	0	0	0	0	0	0	0	0	0	0
Late Hyperphagia (September 1 to November 30)												
Low	0	0	5	12	4	9	4	10	4	12	4	11
Medium	0	0	3	6	2	4	2	5	3	5	2	6
High	0	0	2	4	1	4	2	4	2	4	2	4

[†]Relative value of grizzly bear habitat (Mattson 1999).
[§]Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.

Table 21. Whitebark pine forest habitat permanently affected by paved surfaces or forest clearing.

Alternative	MS 1 Habitat		MS 3 Habitat	
	ha[†]	ac.	ha	ac.
1	0	0	0	0
2	2	4	8	20
3	2	4	5	12
4	2	4	5	13
5	2	4	5	13
6	2	4	6	15

[†]Discrepancies may occur in the conversion of hectares to acres due to rounding.

Grizzly bears often prey on available and vulnerable ungulates. Elk, mule deer, and moose do not winter near the project area, so they do not provide a primary source of carrion for grizzly bear in the spring. All build alternatives would result in a minor loss of ungulate foraging habitat, with negligible impact to elk, deer, and moose populations and the prey base for grizzly bear.

Direct grizzly bear mortality from vehicle collisions is possible with a smoother and wider road surface and the potential for increased vehicle speeds. Alternatives 2 and 4 would have the greatest potential for vehicle/bear collisions because of a wider road width. Project design for

all build alternatives would improve sight distances for drivers to avoid grizzly bears and other wildlife. Landscaping at wildlife crossings would increase security cover for animals, allowing them to see oncoming vehicles as they approach the road. A substantial increase in grizzly bear mortality from vehicle collisions would be unlikely because of the landscaping treatments, low vehicle speeds, and relatively low projected traffic levels, particularly at dawn and dusk when bears are most active. In addition, signage would be added at the western and eastern ends of the wildlife crossing assessment area to warn visitors of the presence of wildlife and the risk for vehicle/bear collisions. Interpretive areas would provide details about grizzly bear habitat and movement.

Anticipated growth in visitors and recreation activity in the area, with or without road improvement, could indirectly affect the grizzly bear by increasing displacement and the potential for grizzly bear conflicts with humans. Increased visitation to the backcountry may affect bear behavior and habitat use outside of the project area. Human-caused grizzly bear mortalities are generally greater in areas where human access and activities are greater (Mattson et al. 1987). Bears near human activity often become habituated. Habituated bears are more vulnerable to hunting and poaching, and often are perceived to be a threat to human safety. Bears that become a nuisance or a threat to human safety may be eliminated. The SNF would continue to manage the forest to minimize human/bear conflicts under all build alternatives.

Grizzly bears may be temporarily displaced by the noise and disturbance associated with construction activities. Blasting, hauling, and other construction activities would be concentrated to minimize impact. The concentration of construction activities would occur spatially (avoiding many separated areas of construction), seasonally (avoiding heavy construction activities in important seasonal habitat), and daily (allowing a minimum 8-hour construction-free period during each 24-hour day). Nighttime construction in locations frequented by grizzly bears would be minimized to avoid affecting bear foraging movement. Grizzly bears in the GYA are most active in early morning and late evening, often resting during the day. Later in the year as bears enter hyperphagia, bears remain active longer during the day and increase nighttime foraging. Although grizzly bears typically avoid areas of human activity, they are attracted to food, the scent of some petroleum products, and other attractants that may be present at a construction site.

A workcamp would increase the number of people in bear habitat, which may increase the potential for bear/human conflicts. A workcamp at Fox Creek Campground would not result in a direct loss or conversion of habitat because construction use would be temporary. A workcamp management plan would be implemented to minimize bear/human conflicts during construction, and would include plans for proper sanitation of human foods, garbage, and other bear attractants. For more detail on workcamp management, see the *Workcamp* discussion on page 80.

In summary, all build alternatives may impact the grizzly bear. The primary impact on grizzly bears would be increased potential for vehicle/bear collisions and a temporary displacement of bears during construction. However, due to mitigation measures discussed previously, adverse effects are expected to be minimal.

Lynx. For all build alternatives, the potential impact on the lynx would be similar to the grizzly bear impacts, and would include a loss of habitat, an increase in habitat fragmentation, and an increased mortality risk. In addition, lynx may

avoid habitat near the road during construction. The region west of the Top of the World Store is a key linkage area for the lynx and provides suitable habitat for both the lynx and its prey. All build alternatives would increase the width of the paved surface and vegetation clearing on cut and fill slopes. Habitat fragmentation would increase slightly. The wider road design for Alternatives 2, 4, and 6 would create a slightly greater barrier to lynx movement than Alternatives 3 and 5. Road widening and the removal of forest cover adjacent to the road would increase the travel distance for lynx movement across open terrain. The width of the new road opening would be substantially less than the typical maximum lynx crossing distance for open terrain of 90 m (300 ft.) (Koehler 1990), but could possibly affect lynx behavior or willingness to cross the road. No suitable lynx denning habitat would be lost in any build alternative.

New retaining walls in Alternatives 2 and 3 within the key linkage area would have a limited effect on lynx movement across the road because most walls would be located in steep areas that probably already preclude lynx movement. Alternatives 4, 5, and 6 have bridges in the key linkage area that would allow lynx movement.

The use of guardrails for all build alternatives would not create a barrier to lynx movement. Guardrails proposed for use on the project (Figure 17) have a 0.3 m (1 ft.) gap between the ground surface and the railing, which would allow lynx movement under the railing.

The increase in road width and loss of forest cover would slightly increase the risk for direct mortality for lynx crossing the road. All build alternatives have relatively low design speeds through the key linkage area.

Because construction would cease during the winter, there would be no construction impact on lynx from November to April. Continued winter recreational activity along the road would be similar to current conditions and could affect lynx activity.

In all build alternatives, a widened roadway would add to the existing habitat fragmentation and increase the crossing distance for lynx. Low projected traffic volumes on the road (1,972 projected average vehicles per day in 2025) are unlikely to adversely affect lynx movement. Areas of retaining wall in Alternatives 2 and 3 may limit lynx movement in short stretches of the highway, but the connectivity of suitable lynx habitat north and south of the road would not change substantially. The potential for direct mortality from vehicle collisions would increase slightly with a wider road and a likely increase in vehicle speeds. Most of the traffic would continue to occur during daylight hours when lynx are less active.

Gray Wolf. The loss of habitat associated with the build alternatives would reduce foraging and cover habitat slightly for elk and deer, which are the principal prey for the wolf. None of the build alternatives are expected to negatively impact ungulate populations that wolves may hunt. The Beartooth pack may avoid the road corridor and material sources during construction because of the increased human activity and noise. Increased speeds in some locations and increased traffic may increase the likelihood of human-caused mortality.

Bald Eagle. The bald eagle is an occasional migrant through the project area. Construction activities may temporarily deter bald eagles from stopovers near the road during migration.

Western Boreal Toad. About 3 to 4 ha (8 to 10 ac.) of wet meadow habitat (Table 16), which provides suitable habitat for the boreal toad, would

be disturbed during project construction. There is a potential for a temporary increase in sedimentation to aquatic habitats could occur, but BMPs would be used to control erosion and sediment.

Forest Service Sensitive Species. All build alternatives would have short-term and long-term impacts on habitat potentially used by Forest Service sensitive species. The difference in impact between alternatives is related primarily to the area disturbed. Direct impacts on habitat used by sensitive species would occur from disturbances within the construction limits and the long-term loss of habitat from additional paved roadway and forest clearing. During construction, noise and human activity may temporarily affect Forest Service sensitive species. Build alternatives may adversely impact individuals, but are not likely to cause a trend toward federal listing or a loss in species viability rangewide. The following discussion addresses potential impacts on Forest Service sensitive species with known presence or suitable habitat in the project area (Table 14).

The long-term loss of forest habitat would reduce available foraging and cover for several mammal species. The loss of forest habitat would slightly reduce foraging opportunities for fishers and martens, which prey primarily on small forest mammals. Wolverines are wide-ranging scavengers that avoid areas of human activity and are unlikely to be affected by forest clearing near the existing road. The spotted bat and Townsend's big-eared bat may use forest habitat, but they are generally present at elevations lower than the project area. The spotted bat and Townsend's big-eared bat would not be affected by any build alternative.

Several bird species also may be impacted by the loss of forest cover. Removal of snag trees or cavity trees may impact nesting habitat for the northern goshawk, black-backed woodpecker, northern three-toed woodpecker, boreal owl, and pygmy nuthatch. Nesting and foraging habitat for the olive-sided flycatcher and golden-crowned kinglet also could be impacted by the loss of forest cover. Merlin may use the edge of forest habitat, and may be affected by road reconstruction.

Disturbance to wet meadow habitat would range from 3 to 4 ha (8 to 10 ac.) for all build alternatives. Most impacts on wet meadow habitat would be mitigated on-site following construction. Construction disturbance along Little Bear Creek and other streams could affect suitable water vole habitat. Disturbance to shrubby riparian areas would affect potential fox sparrow foraging and nesting habitat. Harlequin ducks typically breed in remote streams away from human activities and would not be affected by road reconstruction. Construction disturbance in wet meadow habitat could temporarily affect the tiger salamander, northern leopard frog, and spotted frog. The anticipated disturbance in streams and lakes that support Yellowstone cutthroat trout are expected to be minor and short term during construction.

Trumpeter swan and common loon are likely migrant species that may use habitat in project area lakes. Long-term impacts on lake habitat would be minimal, but construction noise and activity near area lakes could deter stopovers by migrating species. Migrating osprey also may be disturbed by construction activity.

The long-term loss of 7 to 8 ha (17 to 22 ac.) of alpine habitat would impact suitable dwarf shrew habitat. Dwarf shrews have been observed in several alpine locations along the road. The loss of alpine habitat from road reconstruction may impact individual dwarf shrews, but is not likely to cause a trend toward federal listing or a loss in species viability rangewide.

Management Indicator Species. Big game management indicator species would be affected by the loss of habitat and the potential for increased mortality. The long-term loss in foraging habitat for elk and mule deer would range from about 12 ha (29 ac.) for Alternative 3 to 16 ha (39 ac.) for Alternative 2. Other areas temporarily disturbed would be revegetated following construction. The loss of foraging habitat adjacent to the road would be unlikely to adversely impact elk and mule deer populations because foraging activity near the road is limited. Impacts on moose habitat would occur with the loss of forest and wet meadow habitat. Moose activity is generally confined to lower elevation wetland areas located away from the road. Increased vehicle operating speeds in some stretches of the road may increase the risk for ungulate mortality. However, mortality risk is expected to remain low because the reconstructed road would retain its curvilinear nature, and operating speeds would remain low (50 to 75 km/h [30 to 45 mph]) for all build alternatives (Gunther et al. 1998).

The area near the Top of the World Store is the longest linear stretch on the existing roadway. Traffic studies show that this area has the highest operating speeds of Segment 4 (MK Centennial Engineering, Inc. 1998, 2001a), and the area provides spring, summer, and fall range for a number of ungulate species, including moose, elk, and deer. Alternatives 2, 5, and 6 would incorporate a realignment option at the Top of the World Store area, which would have more curves than the existing, linear roadway alignment through this area. Therefore, Alternatives 2, 5, and 6 may decrease operating speeds in the Top of the World Store area and reduce the risk of ungulate/vehicle collisions. Alternatives 3 and 4 closely follow the existing, linear alignment, and the increased roadway width may increase operating speeds in the Top of the World Store area and increase the risk of ungulate/vehicle collisions.

Mountain goats and bighorn sheep primarily use alpine habitat in the project area. Long-term loss of alpine habitat would range from about 7 ha (18 ac.) for Alternatives 3, 5, and 6, to 8 ha (22 ac.) for Alternatives 2 and 4. Bighorn sheep critical winter range and winter range near the Montana/Wyoming border would be impacted by all build alternatives. Total disturbance of critical winter bighorn sheep range would be similar for all build alternatives (1 ha [2 ac.]), as would disturbance to winter range (1 ha [2 ac.]). Revegetation of temporary disturbances would reduce impacts on alpine meadow habitat. The loss of summer and fall range is unlikely to affect the mountain goat because of the abundance of suitable habitat. The loss of winter and critical winter bighorn sheep range would slightly reduce available foraging habitat.

Management indicator recovery species include endangered species that were previously discussed in the *Threatened and Endangered Species* section. The peregrine falcon was recently removed from the list of endangered species, but is still being monitored as populations recover. Peregrines may occasionally hunt in the project area, and the closest known nest site is about 16 km (10 mi.) south of the project area (Barber 1998).

Habitat for several USFS ecological indicator species would be lost or disturbed during construction of all build alternatives. Forested habitat for ruffed grouse, blue grouse, and hairy woodpeckers would be reduced, ranging from about 2 ha (6 ac.) for Alternative 3 to 3 ha (8 ac.) for Alternative 2. Adverse impacts on hairy woodpeckers and blue grouse are unlikely because these species typically prefer aspen forests, which are not present in the project area. Forest clearing

would reduce the amount of available blue grouse foraging and potential nesting habitat. The loss or disturbance of sagebrush habitat near the Ghost Creek material sources site would reduce suitable habitat for Brewer's sparrows. Beaver currently are not present in the project area, and the build alternatives would not affect suitable habitat. Northern goshawks and pine martens are Forest Service sensitive species that were addressed in the *Forest Service Sensitive Species* section.

Other Species of Concern. None of the species of concern identified by the WNDD and Montana Natural Heritage Program (MNHP), discussed on page 143, would be affected by any build alternative because none of the species are likely to occur in the project area.

Cumulative Effects. Planned reconstruction of U.S. 212 east of YNP would be an additional linear disturbance on wildlife habitat adjacent to an existing road. The proposed project, in addition to other work on U.S. 212, would result in a slight regional loss and disturbance of wildlife habitat and increased potential for wildlife mortality. The combined impact of these two road projects is not likely to adversely affect wildlife because most road improvements would be confined within the existing road corridor.

Resource Commitments. All build alternatives would result in an irreversible commitment of alpine and old growth wildlife habitats. Road construction would eliminate alpine and old growth habitat and its use by various wildlife species. The recovery time of alpine and old growth habitats would preclude their re-establishment for decades or centuries following disturbance.

All build alternatives would result in an irretrievable commitment of resources. The paving of habitat and the conversion of forest habitat to meadow habitat within clear zones would be an irretrievable commitment of resources. All build alternatives would disturb areas that would be subsequently mitigated by revegetating. Until revegetated areas return to pre-disturbance productivity, wildlife habitat value would be lower than existing conditions. Decreased productivity would be an irretrievable commitment of resources.

Proposed Mitigation

Mitigation and conservation measures would be incorporated into the selected alternative to minimize potential impacts on wildlife and threatened, endangered, and sensitive species. These measures would be developed and implemented in cooperation with the FHWA, USFS, Wyoming Game and Fish Department, and USFWS during final project design. Mitigation measures applicable to minimizing wildlife habitat impacts and wildlife/vehicle collisions for all species are described below. Proposed additional mitigation for threatened and endangered species also is described. Final project requirements for mitigation will be developed during formal Section 7 consultation with the USFWS. Consultation currently is ongoing due to potential adverse effects to the grizzly bear. In June 2003, the FHWA submitted a Biological Assessment to the USFWS and a Biological Evaluation in August 2003 to the SNF.

Wildlife Habitat

- Limits of construction would be minimized during final design and actual construction.
- All disturbed areas would be revegetated with native species.
- Limit the combined grubbing and grading operations area to 30,000 square meters (3 ha; 7 ac.) of exposed soil at any one time.
- Wildlife crossing areas would receive site-specific landscape revegetation plans, including tree and shrub plantings.

- An 8-hour construction-free gap would occur within each 24-hour period.
- Snags and cavity nest trees would be avoided to the extent possible.
- Abandoned road sections and material sources would be regraded and revegetated with native species to create habitat similar to adjacent undisturbed land.
- BMPs would be used to prevent the introduction of chemical and petroleum products into the environment and to reduce erosion and sedimentation.

Wildlife/Human Interactions

- Wildlife crossing signs and interpretive signs would be used to inform the public about the presence of wildlife.
- Interpretive exhibits would be provided at several major parking areas to inform the public of the presence of wildlife, effects of human activity on wildlife, and the potential for wildlife/vehicle collisions.
- Highly palatable non-native plant species would not be planted adjacent to the road to minimize attracting wildlife.

Grizzly Bear

- The Grizzly Bear Management and Protection Plan would address the facilities (workcamps, staging areas, gravel pit areas, and construction areas), actions, guidelines, and procedures associated with construction to assure compliance with regulations and best management practices in order to prevent human/bear conflicts.
- The contractor, his/her agents, employees, and subcontractors would comply with the requirements of the Grizzly Bear Management and Protection Plan in the conduct of any and all activities authorized. The authorized Forest Officer in Charge may review, revise, and monitor the plan as needed in coordination with the FHWA Contracting Officer.
- The contractor's full cooperation in meeting grizzly bear management goals and objectives would be a condition to receiving authorization to operate.
- Grizzly bear sightings would be reported to the Forest Officer in Charge and the Wyoming Game and Fish Department.
- All construction employees working on-site would be given safety awareness training that includes the following subjects: protected status of the grizzly bear, grizzly bear behavior, proper (human) behavior in bear country, proper attractant storage, conflict avoidance/prevention, assessment of risks/probabilities, encounter procedures, and use of bear repellant spray.
- Bear-proof food storage boxes and sheds would be built to accommodate storage of foods, coolers, barbeques, and any other potential bear attractants. Bear-proof garbage cans and dumpsters would be provided to ensure that no attractants be available to bears and other wildlife. Trash containers would be monitored on a daily basis and emptied as needed to avoid overflowing, not to exceed once per day.
- No long-term food storage or storage in open containers would be allowed.
- No tent camping would be allowed in the workcamp during construction.
- An on-site manager would be responsible for the workcamp, including compliance with the Grizzly Bear Management and Protection Plan.
- Project employees would be prevented from carrying firearms or bringing pets to the workcamp or construction area.

- In the event of a human/bear conflict, or to avoid an imminent potential conflict, the Forest Officer in Charge may order an immediate temporary cessation of all project activity in the immediate area of the conflict or potential conflict if such is needed. The contractor would immediately comply with such action. Such cessation would be in effect until such time as the appropriate authorities have been contacted and any risks to humans and bears have been successfully resolved in accord with the Interagency Grizzly Bear Guidelines. Work cessation due to bear/human conflict would be reported to the USFWS.

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3.6 Vegetation, Timber, and Old Growth Forest

Affected Environment

Vegetation Communities

The Beartooth Plateau supports diverse vegetation communities associated with the wide ranges of elevation, topography, aspect, and moisture. The project area includes alpine meadows above timberline on the eastern portion of the road corridor, and mountain meadows and subalpine and montane forests throughout the western portion of the road corridor. Wet meadows are present along drainages and below snowfields and seeps throughout the project area. Upland mountain meadows are found along the Little Bear Creek drainage and in scattered pockets within the forest. Shrub grasslands are found at lower elevations on the western end of the project area (Figure 39). Vegetation, timber, and old growth forest information contained in this section is summarized from the report, *Vegetation, Timber, and Old Growth Forest* (ERO Resources Corp. 2000b).

Alpine Meadows. The alpine meadow community is present in the project area at elevations above 3,050 m (10,000 ft.). It is the most prevalent vegetation community along Segment 4. Low-growing grasses, forbs, and occasional shrubs tolerant of cold temperatures and windy conditions dominate tundra vegetation in the alpine meadow. The road is one of the longest paved roads to traverse alpine meadows and affords travelers an opportunity to view rarely encountered alpine communities. Moist alpine meadows are found below snowfields or in depressions. Wet meadows found along drainages in the alpine meadow community are discussed briefly below. Rock outcrops and talus are common in alpine meadows on steeper slopes. Rocky slopes and stone fields often support pockets of cushion plants, kings crown, lichens, and mosses.

Rock Outcrop/Talus. Rock outcrops and talus are common on steeper slopes. Rocky outcrops and talus often support pockets of cushion plants, kings crown, lichens and mosses.

Mountain Meadows. Mountain meadows dominated by herbaceous vegetation (grasses and forbs) are present below 3,050 m (10,000 ft.) within the project area. Extensive mountain meadows are found along the existing road from near the Top of the World Store to Long Lake. Mountain meadows may include small stands of scattered Engelmann spruce, subalpine fir, or lodgepole pine. Small areas of mountain meadows are also present within forest clearings. Mountain meadows are located on well-drained soils and support upland vegetation. Shrubs are infrequent, but willow species may occur near moist areas or the margins of wetlands.

Wet Meadows. Wet meadows include wetland and riparian communities that support moisture-loving vegetation. Wet meadows are found at all elevations throughout the project area, and species composition varies with elevation and moisture levels. A more detailed description of wetlands in the project area is found in the previous *Wetlands and Other Waters of the U.S.* section.

Riparian areas form the transition zone between upland and aquatic ecosystems. Riparian vegetation relies on hydrology supplied by a stream or a water body (lake, pond, reservoir, or seep). A riparian area typically is dominated by vegetation similar to the wetland it surrounds, but does not meet the Corps criteria for wetland soils and/or wetland hydrology. Therefore, riparian areas do not satisfy the Corps definition of a jurisdictional wetland and do not fall under Corps jurisdiction. A riparian area provides many of the same functions

as adjoining jurisdictional wetlands. Additional riparian information is contained in the report, *Wetlands, Waters of the U.S., and Riparian Areas* (ERO Resources Corp. 2001b).

Herbaceous, shrub, and forested riparian communities are present in the project area. Herbaceous riparian areas found in subalpine habitats contain species such as tufted hairgrass, bluejoint reedgrass, mountain bluebell, groundsel, subalpine daisy, and alpine bluegrass. Herbaceous alpine and subalpine riparian areas occur throughout the eastern two-thirds of the project area. Shrub riparian areas, which occur both above and below treeline throughout the project area, have an overstory of willow and an understory of groundsel, marsh marigold, bluejoint reedgrass, and various sedges. Forested riparian areas occur mainly in the western one-third of the project area and commonly have an overstory of subalpine fir, Engelmann spruce, and/or whitebark pine with an understory of bluejoint reedgrass, groundsel, globeflower, rushes, and sedges.

Subalpine and Montane Forests. The project area contains subalpine to montane forests of spruce/fir, lodgepole pine, and whitebark pine. Stands of Engelmann spruce and subalpine fir are most common at higher elevation sites and on north-facing moist slopes from treeline to the western end of the project. At elevations below about 2,800 m (9,000 ft.) west of Beartooth Lake, lodgepole pine becomes more prevalent. Lodgepole pine is the dominant species at the Fox Creek Campground.

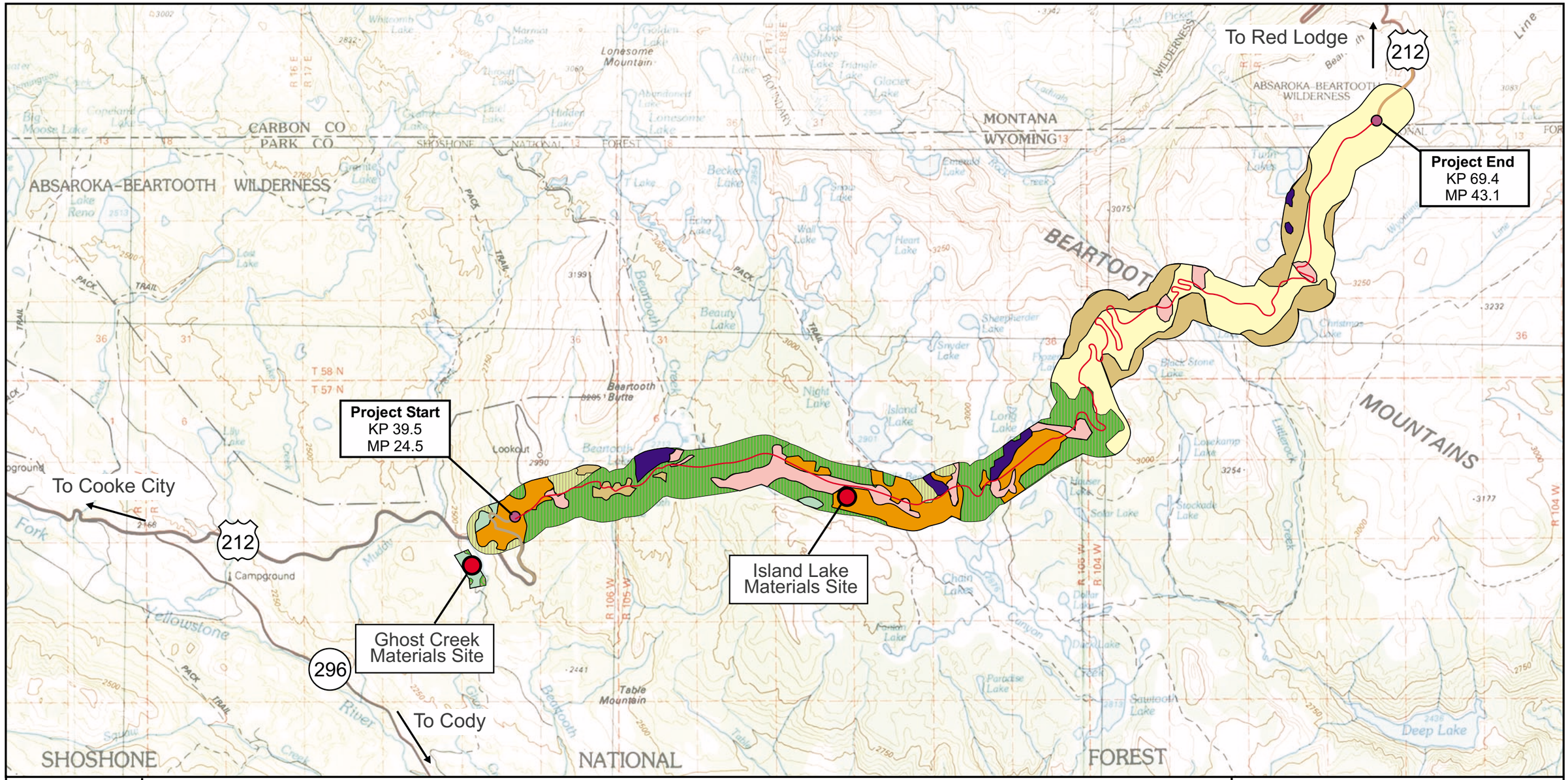
Mountain meadows are found adjacent to the road.

Whitebark pine is found frequently in mixed forests with Engelmann spruce or lodgepole pine, but there are occasional pure stands in the project area. Although it is found on a variety of soil types, whitebark pine prefers dry, rocky, exposed south- and west-facing slopes. Krummholz (stunted, wind-blown trees near timberline) supports scattered low-density whitebark pine trees on rocky slopes.

Shrub Grasslands. Shrub grasslands are found at elevations below 2,500 m (8,000 ft.) in the western portion of the project area at sites such as the Ghost Creek materials site. Big sagebrush is the dominant shrub of this vegetation type. Also present are scattered clumps of common juniper, shrubby cinquefoil, whitebark pine, and Douglas-fir. A large variety of grasses and forbs are present in the understory of the shrub canopy. Shrub grasslands are subject to periodic livestock grazing and may include weedy species, such as thistle or oxeye daisy.

Noxious Weeds

A small area about 10 m^2 (108 $ft.^2$) and additional scattered individuals of a noxious weed, Canada thistle, are adjacent to the road at the Clay Butte Lookout turnoff (KP 40.25). Canada thistle and oxeye daisy are found at the Ghost Creek material site. Livestock grazing is likely the primary mechanism for the spread of weeds at Ghost Creek. The SNF currently is treating the Ghost Creek area to eradicate noxious weeds. In addition, introduced non-native species such as Kentucky bluegrass, smooth brome, timothy, and annual weeds are present primarily in the western, lower elevation portions of the project area.



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- Shrub/grassland meadow
- Mountain meadow
- Alpine meadow
- Wet meadow
- Old growth forest
- Subalpine and montane forest
- Rock outcrop/talus
- Open water
- Materials source

Source: ERO Resources, Vegetation, Timber & Old Growth Forest Final Report 2000.

1 Inch = 1.25 Miles

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Figure 39
Vegetation Communities and Old Growth Forest

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Species of Concern

No plant species listed as threatened or endangered by the USFWS are known to occur in the project area. The FHWA identified occurrences of three USFS Region 2 sensitive species of concern, twelve Wyoming species of concern, two species on the Wyoming plant watch list, and one species with uncertain status within the project area. Some of these species also are listed by the MNHP (Table 22). Plant lists for USFS, Wyoming species of concern, and the Wyoming plant watch are overlapping, i.e., plants may occur on more than one list. Information about species of concern contained in this section is summarized from the report *Plant Species of Concern* (ERO Resources Corp. 2000c).

Forest Service Sensitive Species. Forest Service sensitive species found in the project area are pink agoseris, livid sedge, and Hall's fescue. Pink agoseris populations are tracked by WNDD and the MNHP (WNDD 2001; MNHP 1999). Due to the identification of new populations of this plant, the Forest Service is considering removal of pink agoseris from the sensitive species list. Pink agoseris is a common species in large sections of the project area, in moist to wet meadows from Top of the World Store to Frozen Lake and elevations of 2,710 to 3,125 m (8,900 to 10,260 ft.). The total number of individuals occurring inside the project area is estimated to be more than 10,000 (ERO Resources Corp. 2000c). The largest areas of pink agoseris habitat occur near the Top of the World Store, in the vicinity of the Island Lake access road, and on the slopes south of Little Bear Lake and Long Lake.

Livid sedge is believed to be globally secure but is considered sensitive by the USFS Region 2 and the adjacent Region 1 (including Montana). During field surveys, a previously unknown population of livid sedge was discovered in a wetland near the Clay Butte Lookout turnoff.

Table 22. Plant species of concern found along the road.

Common Name	Scientific Name	Protection Status		
		USFS	WY	MT
Pink agoseris	*Agoseris lackschewitzii*	Sensitive	Watch list	Watch List
Northern bentgrass	*Agrostis mertensii*		Uncertain	Watch List
Lesser panicled sedge	*Carex diandra*		Species of Concern	
Mud sedge	*Carex limosa*		Species of Concern	
Livid sedge	*Carex livida*	Sensitive	Species of Concern	Species of Concern
Short-leaf sedge	*Carex misandra*		Species of Concern	Watch List
Nelson's sedge	*Carex nelsonii*		Species of Concern	Watch List
Fan-leaved fleabane	*Erigeron flabellifolius*		Watch List	Watch List
Sheathed cotton-grass	*Eriophorum callitrix*		Species of Concern	Species of Concern
Hall's fescue	*Festuca hallii*	Sensitive	Species of Concern	
Three-flower rush	*Juncus triglumis* var. *triglumis*		Species of Concern	Watch List
Siberian kobresia	*Kobresia schoenoides*		Species of Concern	Species of Concern
Koenigia	*Koenigia islandica*		Species of Concern	Species of Concern
Oeder's lousewort	*Pedicularis oederi*		Species of Concern	
Farr's willow	*Salix farriae*		Species of Concern	

Hall's fescue is ranked as globally rare to apparently secure. In 1998, a small population, the first known occurrence in the Beartooth Mountains, was discovered near an old material source north of Gardner Lake.

Wyoming Species of Concern. Livid sedge and Hall's fescue, discussed previously, are two Wyoming species of concern found in the project area. In addition, ten plant species listed as species of concern by the WNDD—lesser panicled sedge, mud sedge, short-leaf sedge, Nelson's sedge, sheathed cotton-grass, three-flower rush, Siberian kobresia, koenigia, Oeder's lousewort, and Farr's willow—are found in the project area. Sheathed cotton-grass, Siberian kobresia, and koenigia are also considered species of concern by the MNHP, and three other species—short-leaf sedge, Nelson's sedge, and three-flower rush—are listed as Montana watch species. All species are found in wetlands along the road.

Suitable Timber Resources

Suitable timberland has the potential for producing crops of industrial wood products. Lands within the project area are unsuitable for timber production due to low productivity, or potential for resource damage to soils or watershed conditions if trees were harvested. Stands of suitable timber are located near the Fox Creek Campground, but not within the campground. Suitable timber is not discussed further.

Old growth forest near the Beartooth Ravine.

Old Growth Forest

The project area includes areas of spruce/fir, lodgepole pine, and whitebark pine old growth forests identified from field observations and/or photo interpretation (SNF 1999). Most trees in old growth forests are greater than 23 cm (9 in.) diameter at breast height. The SNF classifies the majority of the forested areas in the project area as old growth forest (Troxel 1999). No old growth forest is within the Fox Creek Campground.

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not affect any vegetation communities or individual species, including threatened and endangered plant species, Forest Service sensitive species, other species of concern or old growth forest. The No Action Alternative would not involve land-disturbing activities likely to increase the number and distribution of noxious weeds. Noxious weeds currently present in the project area would continue to be subject to USFS weed management practices.

Indirect impacts on vegetation may occur with increased traffic and recreational activity along the road corridor. Traffic and recreational activity would increase with both no-build and build alternatives. Vegetation impacts may occur from recreation activity including hiking on backcountry trails or camping.

Effects of the Build Alternatives

Vegetation Communities. Many of the impacts on vegetation resources would be similar for each of the build alternatives (Table 23). All build alternatives would result in both temporary

and permanent losses of vegetation resources. Short-term impacts would occur in areas disturbed by construction that would be outside of the footprint of the road. These areas would be reclaimed using native vegetation species following construction. In some areas, a conversion of one vegetation type to another would occur. For example, areas presently forested within the road clear zone would be permanently converted to meadow or grassland.

A long-term loss of vegetation would occur within the footprint of the new road. In these areas, vegetated cover would be replaced with an impermeable surface. Alternatives 2 and 4would have the greatest impact on vegetation because of the construction of a 9.6-m (32-ft.) or 9.0 (30 ft.) wide road for some or all of the road, a large number of pullouts, and realignment options. Alternatives 3 and 5, which would have a roadway width of 8.4 m (28 ft.) and fewer and smaller pullouts, would have the least impact on vegetation. Alternative 6, which would have a roadway width of 9.6 m (32 ft), 9.0 m (30 ft), and 84 m (28 ft) would have less impact than 2 and 4, but more than 3 and 5.

Indirect impacts on vegetation may occur from increased recreational activity along the road corridor with or without improvements. Increased vegetation impacts could occur from activities including hiking on backcountry trails, camping, and visitor stops at scenic vistas.

Alpine Meadows. Alpine meadows would be the vegetation community most affected by the project. Between 7 ha (17 ac.) and 8 ha (22 ac.) of alpine meadow would be affected permanently by the build alternatives. The alpine meadow community would be the most difficult to revegetate because of the brief growing season and harsh growing conditions. Plant cover in revegetated areas would be similar to adjacent undisturbed areas after about 5 years, but development of comparable vegetation density and species composition would take 10 or more years (Brown and Johnston 1981; Chambers et al. 1988).

Mountain Meadows. All build alternatives would affect between 3 and 4 ha (6 and 11 ac.) of mountain meadow communities. Mountain meadow communities disturbed by construction activities but outside the road footprint would be reseeded. Plant cover in reseeded areas would be

Table 23. Vegetation communities permanently disturbed.

Vegetation Community	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Alpine meadow	0	0	8	20	7	18	8	22	7	18	7	17
Mountain meadow	0	0	4	9	3	6	3	8	4	9	4	10
Wet meadow[§]	0	0	2	4	2	4	2	4	1	3	2	4
Subalpine and montane forest	0	0	3	8	2	6	3	7	3	7	3	7
Shrub grassland	0	0	0	0	0	0	0	0	0	0	0	0
Rock outcrop/talus	0	0	1	4	1	3	2	4	1	3	1	3
Total[*]	0	0	18	45	15	37	18	45	16	40	17	41

[§] See *Wetlands and Other Waters of the U.S.* section for more details.

[*]Discrepancies may occur in the totals and in the conversion of hectares to acres due to rounding.

similar to adjacent undisturbed areas after about 5 years, but development of comparable vegetation density and species composition would take 10 or more years (Brown and Johnston 1981; Chambers et al. 1988).

Subalpine and Montane Forests. Road pavement in all build alternatives would affect between 2 and 3 ha (6 and 8 ac.) of forested communities. In addition, an estimated 50 percent of the forested area cleared during construction would be kept cleared of trees and revegetated to meadow communities. On the remaining 50 percent, trees would be planted in disturbed areas and also revegetate naturally. There would be a long-term conversion of 5 to 6 ha (12 to 15 ac.) of forest to meadow communities.

Shrub Grasslands. About 11 ha (28 ac.) of shrub grasslands would be disturbed, but not permanently lost, at the Ghost Creek materials site. The materials site would be reseeded following completion of road construction.

Wet Meadows. Wet meadows are composed of wetlands and associated riparian areas. Between 1 and 2 ha (3 and 4 ac.) of wet meadows would be permanently converted to road surface in all build alternatives. About one third of the wet meadows impacted are riparian areas [0.7 ha (1.3 ac.)]. Most of the affected riparian areas occur along Little Bear Creek near the Top of the World Store. Riparian areas would recover from most short-term impacts. Forested and shrubby riparian areas within the clear zone of the new road would be periodically cleared of woody vegetation as part of normal maintenance activities and would be converted to a grassland community. Permanent impacts on wetlands are discussed in the previous *Wetlands and Other Waters of the U.S.* section.

Landscaping and Revegetation Plan. A goal for landscaping and revegetating the proposed project is to re-establish native plant species common to the Beartooth Plateau. Because disturbances associated with the original road construction were not properly revegetated and are still noticeable, a significant issue associated with the project is the revegetation of disturbed areas. To address this concern, the FHWA began conducting revegetation research on the Beartooth Plateau in 1999. The research began with an extensive review of state-of-the-art revegetation practices (ERO Resources Corp. 2001a). Test plot studies were conducted at three high-alpine locations to evaluate various revegetation techniques. Revegetation variables tested in the test plot studies included: types of organic soil amendments; surface mulches such as erosion control fabric, wood chips, and bonded fiber matrix; seeding densities; slope steepness; and the effectiveness of collecting seed from the Beartooth Plateau (ERO Resources Corp. 2000d; 2001e; 2002b). Additionally, a large-scale study is being conducted to determine the feasibility of collecting seed on the Beartooth Plateau and cultivating collected seed on a farm to supply a large amount of native seed adapted to the Beartooth Plateau for the proposed project.

Revegetation studies are underway to learn the best methods for revegetating disturbed areas.

Revegetation of disturbed areas would include the use of native species, many of which could be collected on the Beartooth Plateau, if growout experiments are successful. Areas would be revegetated with species similar to those found in undisturbed areas. Whitebark pine would be planted in forested areas. Revegetation types labeled "rocky" typically have thinner soils than those labeled "mesic", and require different seed mixes. Plans are being developed for the following revegetation types:

- Rocky Forest and Mesic Forest
- Rocky Meadow and Mesic Meadow
- Rocky Alpine Meadow and Mesic Alpine Meadow
- Riparian

A sample revegetation plan for forested areas is shown on Figure 30. The detailed plan would be applied in select forested areas and would include tree, shrub, and herbaceous plantings, native grass and forb seeding, and rock and log placement. Similar plans have been developed for other vegetation communities.

Topsoil would be salvaged to allow for colonization by seed, rhizomes, or root material in the topsoil. Careful topsoil salvaging would add to the diversity of species in disturbed areas and would increase the speed with which vegetation can colonize disturbances in the project site. In some areas, sod would be transplanted or native species would be planted to add more diversity to the landscape and to revegetate areas with erodible soil conditions.

After vegetation becomes re-established, most disturbed areas would become "finally stabilized," as required by a WDEQ stormwater permit. Finally stabilized means all soil-disturbing activities at the site have been completed, and a uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all disturbed unpaved areas and areas not covered by permanent structures. Based on the revegetation tests conducted on the Beartooth Plateau, the FHWA anticipates most areas would become finally stabilized within 5 years after completing revegetation. In more exposed locations, especially those in which snow covers the soil well into the growing season such as the Bar Drift or the west summit, revegetation may be a slow process. Initial revegetation efforts may not succeed in these or other locations, and revegetation monitoring in the period following reconstruction may conclude that additional revegetation efforts would be necessary. Attempts will not be made to establish vegetation on areas of exposed rock or boulder fields, except in small pockets, to match other exposed rock or boulder fields in the area.

The FHWA would monitor the revegetated slopes during the period after completing construction and before the slopes become finally stabilized. Monitoring would include inspection of the revegetated areas at least once every quarter whenever the road is open. Quantitative monitoring also would be conducted to evaluate the amount of cover on undisturbed areas and revegetated slopes.

Existing plant communities disturbed by the project have developed over hundreds of years. These communities have a diverse mixture of plant species that have adapted to the montane, subalpine, and alpine environments present along the road. Revegetation of the areas disturbed by the project would use native species adapted to the specific environment. These species would be capable of developing a self-sustaining plant community that would stabilize disturbed areas and reduce soil erosion by wind and water. The revegetated areas could have plant communities

with different species composition than adjacent undisturbed areas because not all species that occur in undisturbed areas can be propagated, and many species present in undisturbed areas may not be capable of colonizing disturbed areas. The color and texture of the reclaimed areas would contrast with the adjacent undisturbed areas. The difference would be most noticeable where abandoned road sections are reclaimed, especially along linear sections, such as in the Top of the World Store area. The establishment of plant communities on reclaimed areas to a composition similar to adjacent undisturbed areas may take 10 or more years, particularly at higher elevations.

Noxious Weeds. All of the build alternatives have the potential to support the infestation and spread of noxious weeds associated with ground-disturbing activities. Weeds frequently invade disturbed ground where they easily establish and out-compete native species if left unchecked. Implementation of BMPs for weed control, as described in the *Proposed Mitigation* section, would minimize the potential for weed establishment and long-term impacts.

Species of Concern. Only one species listed as sensitive by the SNF, pink agoseris, would be affected by the build alternatives (Table 24). Two other SNF sensitive species, livid sedge and Hall's fescue, exist in the project area but would not be affected by any build alternative. Populations of pink agoseris occur throughout lower elevations of the project area and would be affected by all build alternatives. Alternative 2 would impact the most pink agoseris habitat (5.0 ha [12.3 ac.]) and Alternative 3 would affect the least (3.4 ha [8.5 ac.]). While all build alternatives would affect pink agoseris populations, the species is abundant within the project area. It is expected to re-colonize revegetated disturbed areas of suitable habitat. None of the build alternatives would cause a trend toward federal listing or result in a loss of species viability rangewide for pink agoseris.

Five of the twelve plant species listed as Wyoming species of concern occurring in the project area, short-leaf sedge, Nelson's sedge, Siberian kobresia, koenigia, and Oeder's lousewort, would be affected by the build alternatives. Alternative 4 would have the greatest (1.8 ha [4.3 ac.]) effect on habitat for

Table 24. Habitat of plant species of concern affected by project.

Species of Concern	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Pink agoseris*	0.0	0.0	5.0	12.3	3.4	8.5	3.8	9.5	4.3	10.6	4.5	11.1
Short-leaf sedge†	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.8	0.0	0.1	0.1	0.2
Nelson's sedge†	0.0	0.0	0.1	0.2	0.1	0.2	0.4	0.9	0.1	0.2	0.1	0.2
Siberian kobresia†	0.0	0.0	0.4	0.9	0.3	0.8	0.4	0.9	0.3	0.8	0.3	0.8
Koenigia†	0.0	0.0	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
Oeder's lousewort†	0.0	0.0	0.3	0.7	0.2	0.6	0.6	1.4	0.2	0.6	0.3	0.7
Northern bentgrass§	0.0	0.0	0.3	0.6	0.2	0.6	0.3	0.6	0.2	0.6	0.2	0.6
Total	0.0	0.0	6.3	15.2	4.3	11.1	5.9	14.4	5.2	13.2	5.6	13.9

* = USFS Region 2 Sensitive species
† = Wyoming species of concern
§ = Wyoming watch list species

these species. Alternatives 3 and 5 would have the least impact, affecting 0.7 ha (2.0 ac.) of habitat. The other alternatives would have intermediate effects, with about 1.0 ha (2.3 ac.) affected. All impacts on Wyoming species of concern would be considered long term because these species occur in alpine wetlands, the revegetation of which takes considerable time. Opportunities to mitigate alpine wetlands were not identified.

The build alternatives would affect one plant species with unknown status in Wyoming (northern bentgrass). About 0.25 ha (0.6 ac.) of northern bentgrass habitat would be affected by all build alternatives. All impacts on northern bentgrass would be considered long term because this species occurs in alpine areas and would be slow to re-colonize disturbed areas.

Old Growth Forest. All build alternatives would affect old growth forest in the project area (Table 25). Alternative 2 would have the greatest impact on old growth forests because of the road width (9.6 m (32 ft.), the number of pullouts, and a realignment near the Top of the World Store. Alternative 2 would affect 15 ha (37 ac.) of old growth forest. Alternative 3 would have the least impact on old growth forest (11 ha [27 ac.]).

All disturbances to old growth forests would be considered long term because of the time required, 200 or more years, for the resources to develop.

Table 25. Old growth forest affected by project.

Alternative	Hectares	Acres
1	0	0
2	15	37
3	11	27
4	12	30
5	12	30
6	13	32

Old growth forest within the road clear zone would be permanently converted to grassland or meadow communities. Impacts on areas other than the road clear zone and the footprint of the new road would be re-colonized by forest species, but would not develop into old growth forest in the reasonably foreseeable future.

Cumulative Effects. Reconstruction of U.S. 212 from the YNP entrance west of Silver Gate, Montana through Cooke City to the Montana/Wyoming state line, in combination with the proposed project, would result in a cumulative effect on forest and mountain meadow vegetation communities. These projects following revegetation are not expected to significantly affect vegetation resources.

Resource Commitments. All build alternatives would result in an irreversible commitment of alpine and old growth vegetation communities given the considerable length of time it takes for these communities to re-establish themselves. The recovery time of alpine vegetation communities and old growth forest would preclude their restoration for decades or centuries following disturbance. Rare plants found in alpine wetlands would be irreversibly disturbed by all build alternatives.

All build alternatives would result in an irretrievable commitment of resources. The paving of vegetation communities and the conversion of forest vegetation to meadow vegetation within clear zones would be an irretrievable commitment of resources. All build alternatives would disturb vegetation communities that would be subsequently mitigated by revegetating. Until revegetated areas return to pre-disturbance productivity, vegetation production would be lower than existing conditions. Decreased production would be an irretrievable commitment of resources.

Proposed Mitigation

During construction, impacts to vegetation would be minimized using the techniques described in the *Techniques to Avoid and Minimize Impacts* section on page 64. New impacts would be avoided to the extent possible. The FHWA would implement a landscaping and revegetation plan to mitigate unavoidable effects on vegetation. Mitigation to reduce impacts on vegetation resources and ensure revegetation of disturbed areas would include the following measures:

- Collecting native seed before construction for use in revegetation
- Using native species common on the Beartooth Plateau when collected seed is not sufficient
- Establishing well defined construction limits to minimize vegetation disturbance
- Using BMPs to prevent wind and water erosion
- Using salvaged topsoil and its associated seed and plant parts
- Using native seed and planting shrubs and trees according to site-specific conditions and vegetation communities
- Applying soil amendments, mulches, organic matter, and other measures to facilitate revegetation
- Monitoring vegetation cover and implementing contingency and maintenance plans until vegetation cover is 70 percent of the original background vegetation cover in accordance with the Wyoming NPDES permit requirements. Monitoring would include inspection of the revegetated areas at least once every year whenever the road is open until the NPDES permit requirements are met.

Specific additional measures to prevent the introduction and spread of noxious weeds during construction would include:

- Implementing a weed management plan in accordance with the Wyoming Weed and Pest Control Act and other directives to prevent weed infestation and spread. A weed management plan would be incorporated into the landscaping and revegetation plan.
- Minimizing the area of disturbance and the length of time that disturbed soils are exposed
- Minimizing weed seed in imported soil materials
- Requiring that earth moving equipment be washed prior to entering the project area and inspecting them to prevent importing weeds on vehicle tires and mud
- Limiting the use of fertilizers that may favor weeds over native species
- Using periodic inspections and spot controls to prevent weed establishment. If weeds invade an area, an integrated weed management process to selectively combine management techniques (biological, chemical, mechanical, and cultural) to control the particular weed species following USFS guidelines would be used.

In 2002, the FHWA completed a survey of historic disturbances along the highway that have not revegetated naturally (ERO Resources Corp. 2002c). The evaluation considered each site's existing conditions and the potential to revegetate. The FHWA would evaluate these areas during final design to see which would be feasible to revegetate. For example, an abandoned borrow area is east of Long Lake and north of the road. Wetlands have formed in part of the area. The FHWA is investigating this area as a possible wetland mitigation site. If the area is not suitable

as a wetland mitigation site, the FHWA may fill some or all of the area if excess waste rock and fill materials are available. If filled, the area would be revegetated.

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3.7 Land Use

Affected Environment

Existing Land Use

All land adjacent to Segment 4 is National Forest System lands managed by the SNF in accordance with its Land and Resource Management Plan (SNF 1986). The plan currently is being revised. Existing land uses in the vicinity of the road include recreation, wildlife habitat, and livestock grazing.

Recreation. A wide variety of year-round recreational activities occur near the road. The proximity to the Absaroka-Beartooth Wilderness provides opportunities to access the Wilderness. Areas along the road are used during the summer for camping, mountain biking, and four-wheel driving; in the fall for hunting; and in the winter for snowmobiling and cross-country skiing. The existing Fox Creek Campground workcamp site currently is used for public camping. Recreation is discussed in greater detail in the *Recreation Resources* section.

Wildlife Habitat. Lands near the road and Fox Creek Campground provide important habitat for grizzly bear, deer, elk, and a variety of other species. In the past, trout have been introduced into many of the lakes along the road. Wildlife is discussed in greater detail in the *Wildlife* section.

Grazing. Grazing along the road occurs in designated areas called grazing allotments, and permits are issued for either cattle and horses, or sheep and goats. The Fox Creek Campground falls within the Lake Creek cattle and horse grazing allotment, which is permitted for a total of 315 cow-calf pairs and 30 horses. The Ghost Creek grazing allotment, which is permitted for 319 cow-calf pairs, is near Clay Butte. Cow-calf pairs are grazed from June 21 until October 30, and horses are grazed from June 21 until July 31 (Hicks 2000). The Bennett Creek grazing allotment is directly south and east of the project area between Albright Curve (KP 64.6) and the end of the project. This allotment currently is permitted for both sheep and cow-calf pairs. The SNF is working on providing an alternative to sheep grazing in this allotment. The remainder of the project area between Clay Butte Lookout turnoff and Albright Curve is a mix of closed and vacant (not currently occupied) allotments. Closed allotments cannot be grazed, and vacant allotments could potentially be stocked at some future time. It is unlikely that the vacant allotments would be stocked (King 2001).

Withdrawals. Both sides of Segment 4 are protected from development by a 75-m (250-ft.) withdrawal on each side of the road. Under EO 5949, a 75-m (250-ft.) corridor along Segment 4 was withdrawn from settlement, location, sale, entry, or other disposal and was reserved for park approach road purposes.

Existing Land Management

The project area is primarily rural and is located in and managed by the SNF. The CNF adjoins the SNF to the north and the GNF adjoins the SNF to the west. All three National Forests have developed plans that establish goals, objectives, and standards for management of forest resources including vegetation, wildlife and fish, wilderness, range, timber, minerals, soils and water, wetlands and floodplains, air, recreation, cultural, and visual resources.

Forest-Wide Goals and Objectives. Land management direction for the SNF is described in the Land and Resource Management Plan (SNF 1986). This document provides forest-wide management goals, objectives, and standards. It

also provides goals and standards for subunits of the SNF called Management Areas (MAs).

Management Area Direction–Shoshone National Forest. Most of the project area, including the Fox Creek workcamp site, is in MA 2B (Figure 40). The emphasis of MA 2B is on rural and roaded natural recreation opportunities. Motorized and non-motorized recreation activities, such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling, and cross-country skiing, are primary uses.

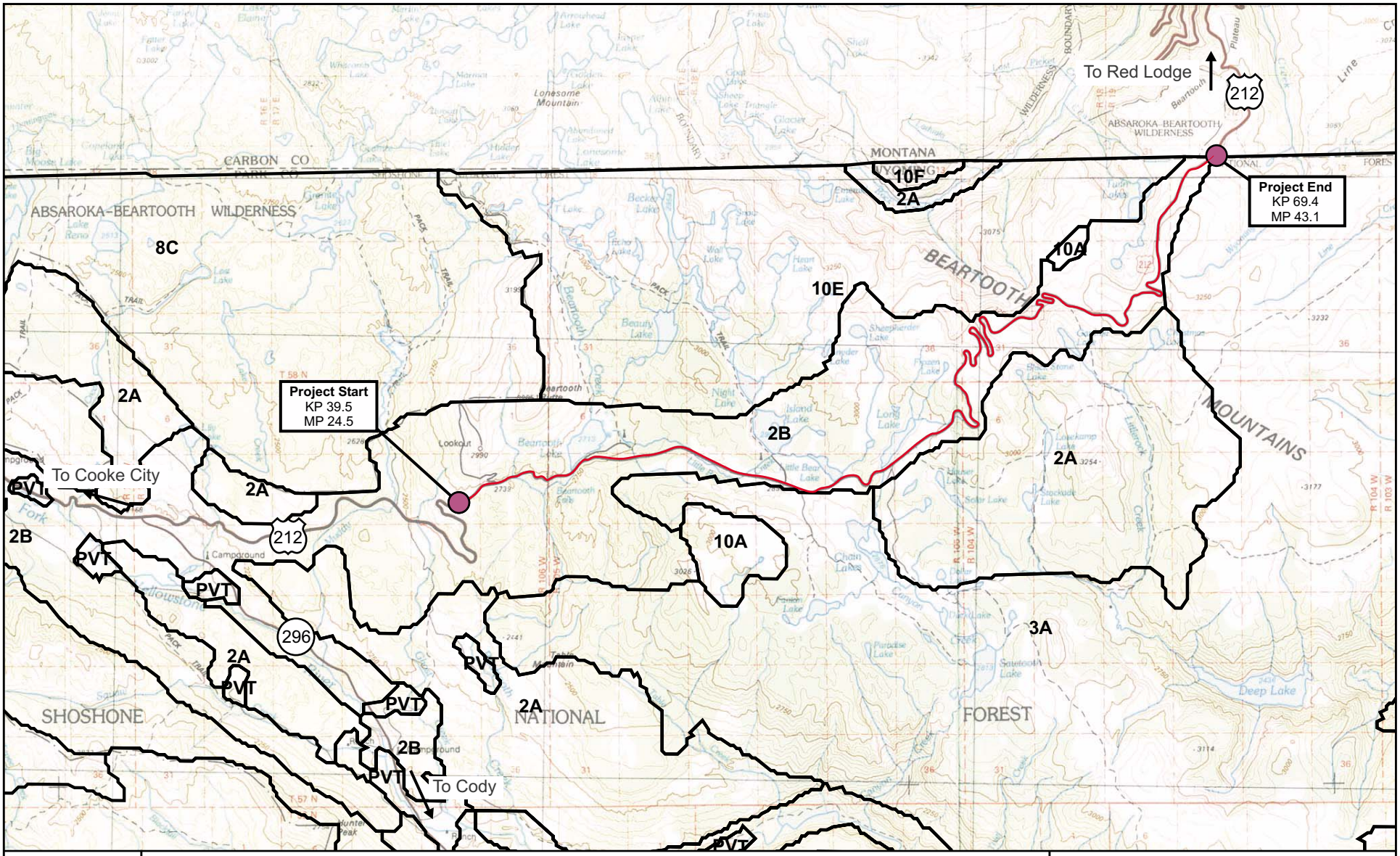
MA9 for riparian areas is managed for all of the component ecosystems of riparian areas, including the (1) aquatic ecosystem, (2) the riparian ecosystem, and (3) adjacent ecosystems that remain within about 30 m (100 ft.) from both edges of perennial streams, lake shores, and other still water bodies. The goals are to provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water body shorelines. Management activities are designed and implemented to sustain inherent visual values that blend with the surrounding natural landscapes. MA 9A is not mapped separately in the project area or shown on Figure 40 because riparian areas are relatively narrow zones adjacent to perennial streams, lakes, and other still waters. Riparian areas are discussed in greater detail in the *Vegetation, Timber, and Old Growth Forest* section of the EIS. Maps of riparian areas are found in the *Wetlands, Waters of the U.S. and Riparian Areas Final Report* (ERO Resources Corp. 2001b).

Grazing sheep near Top of the World Store during the 1950s

Photo © Flash's, Red Lodge, MT

Other MAs adjacent to the project area are managed for semi-primitive motorized recreation opportunities (MA 2A), semi-primitive non-motorized recreation opportunities (MA 3A), semi-primitive wilderness opportunities (MA 8C), and Research Natural Areas (MA 10A).

Analysis Areas on the Shoshone National Forest. In addition to MAs, the SNF has established analysis areas in its Forest Plan detail. The analysis areas describe the practices, outputs, and effects associated with implementing the management direction in each management area. The project area falls primarily within the Beartooth Highway Analysis Area. Resources in the analysis area include MS 1, 2, and 3 grizzly bear habitat, riparian habitat, two developed campgrounds, two developed trailheads, several developed overlooks, an interpretive facility at the Clay Butte Lookout, and a small ski area. Management activities, transportation system development and use, and other developments are monitored to achieve minimum standards for soil productivity and other watershed values. Standards for soil productivity include avoiding compaction and rehabilitation of impacted areas (Houston 2000). All unsurfaced roads are closed seasonally to protect sensitive soil and watershed resources. Sheep and cattle grazing exists in the analysis area.



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2A - Semi-primitive motorized recreation opportunities
2B - Rural and roaded natural recreation opportunities
3A - Semi-primitive non-motorized recreation opportunities
8C - Semi-primitive wilderness
10A - Research natural area
10E - Protection of existing wilderness characteristics
PVT - Private land

Source: Shoshone National Forest Land and Resource Management Plan 1986

N

1/2 Inch = 1 Mile

Figure 40
Shoshone National Forest Management Areas

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Special Use Permit Areas. The USFS authorizes occupancy of National Forest system lands in the project area under two Special Use permits. The Top of the World Store, located between Beartooth and Island Lakes, operates under a Special Use permit from the SNF. It sells food, gas, groceries, and other traveler supplies. The store is open from about Memorial Day until the road closes in October. The Red Lodge Race Camp maintains a private downhill race training camp under a Special Use permit from the first week of June until early July depending on snow conditions. The camp is not open to recreational skiing. The SNF issues several permits annually for commercial photography. The existing highway and surrounding landscape is a popular location for still and motion picture commercials and advertising. Outfitters also have operations in the vicinity of the project area on an intermittent basis.

Private Land. No private land is adjacent to the road. The Ghost Creek Road (FR 118) provides access to private land about 3.2 km (2 mi.) south of U.S. 212. The Ghost Creek Road would be used to provide access to the Ghost Creek materials source and staging area.

Corridor Management Plan

A corridor management plan for the portions of the Beartooth Highway designated as an All-American Road (including all of Segment 4) was completed in 2002 (The Beartooth All-American Road Steering Committee 2002). The Plan provides guidance for management of scenic, natural, historical, cultural, archaeological, and recreation resources of the highway corridor. Several "significant needs and concerns" of the public regarding the highway corridor are addressed in the plan, including the need for:

- More interpretation sites, facilities, and visitor accommodation
- Clearer and more consistent signage
- Increased marketing and promotion for the byway
- Improved roadway to better accommodate visitor use

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not affect existing land uses along the road. The road would remain within MA 2B and the withdrawal established by EO 5949.

Effects of the Build Alternatives

Reconstruction of Segment 4 would occur over a 6-year period. Construction would be phased, with the western portion (project start [KP 39.5] to road closure gate [KP 52.4]) probably being completed first. Road construction activities may temporarily disrupt recreation, special use recreation operations, commercial film permit operations, grazing uses, and wildlife habitat. Some wildlife habitat and grazing land would be permanently lost by paving. Other habitat would be converted from forest to meadow (for more specific impacts, see the *Recreation Resources; Vegetation, Timber, and Old Growth Forest;* and *Wildlife* sections of this chapter).

With the exception of a few areas along the road where alignment options exist, construction activity would be confined to areas withdrawn for park approach purposes under EO 5949. All build alternatives except Alternative 3 would extend beyond the EO 5949 withdrawal: Alternatives 2, 5, and 6 at the Top of the World Store, and Alternative 4 at the Albright Curve (Table 26). MA 2B would not be adversely affected because long-term road use would be consistent with existing land management goals for MA 2B. The

Table 26. Lengths of new alignment outside the 75-m (250-ft.) withdrawal.

Realignment Area	Alternative											
	1		2		3		4		5		6	
	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.
Top of the World Store	0	0	1,450	4,750	0	0	0	0	895	2,935	895	2,935
Albright Curve	0	0	0	0	0	0	132	433	0	0	0	0

maintaining agency would acquire a land transfer from the SNF for those portions of the new road that would be outside the withdrawal.

During the 6-year construction period, Forest Road 118 would be used to provide access to the Ghost Creek materials source and staging area. Public access on the road would be maintained during construction.

Cumulative Effects. Other foreseeable activities in the area include the widening of 13.5 km (8.4 mi.) of U.S. 212 between the northeast entrance to YNP and the Montana/Wyoming state line east of Cooke City. This project, when combined with the proposed project, would convert some private and Federal lands to highway use. The amount of private land converted cumulatively would be very small and would not alter the land use patterns of Park County, Montana. The amount of Federal land converted cumulatively would be very small relative to the large contiguous areas of National Forest System lands adjacent to the road. The projects would not cumulatively affect the management of the SNF or the GNF.

Resource Commitments. Resource commitments associated with wildlife habitat are discussed in the *Wildlife* section. All build alternatives except Alternative 3 would have irretrievable impacts to land use because new road sections outside of the existing withdrawal would require land use changes.

Proposed Mitigation

Because none of the build alternatives would significantly affect land use in the area, no mitigation is proposed.

Compliance with the Shoshone National Forest Plan

All build alternatives would comply with all forest-wide standards and guidelines. All build alternatives would comply with all standards and guidelines of MA 2B (Rural and Roaded Natural Recreation Opportunities) and MA 9A (Riparian Areas). Areas disturbed by the project would be confined primarily to areas immediately adjacent to the highway. The casual forest visitor would not be able to discern the effect of construction in the long term after revegetation is achieved. The highway is the primary viewing point and is considered neutral in assessing Visual Quality Objectives. The areas adjacent to the road would meet the Visual Quality Objective of Retention after construction. Visual quality is discussed in more detail in the *Visual Resources* section.

References

Beartooth All-American Road Steering Committee. 2002. Beartooth All-American Road Corridor Management Plan. January.

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3.8 VISUAL RESOURCES

Affected Environment

The road is one of the most beautiful drives in America, offering rare opportunities to view high mountain environments. The eastern half of Segment 4 of the road is above treeline, offering views of distant mountains. The western half passes through mountain meadows and forests. Portions of the road are a designated All-American Road and a USFS and Wyoming Scenic Byway.

The visual resources of the project area were evaluated using three landscape characteristics: scenic quality, landscape sensitivity, and external visibility. Scenic quality is a measure of the visual variety, size, shape, and contrast of elements such as land, rock and water forms, containment, and color and texture. Landscape sensitivity is a measure of the sensitivity of a landscape to man-made changes. For example, existing areas of steep slopes would require larger cuts and fills than existing areas of more gentle slopes, and, consequently, are more sensitive to change. External visibility relates to the visibility of the road from sensitive viewing locations, such as the Beartooth Lake and Island Lake Campgrounds, the Absaroka-Beartooth Wilderness, or area lakes. This section summarizes the visual resource information of the *Final Visual Resource Assessment Report* (Holdeman Landscape Architecture 2002).

Four areas of distinct scenic quality and landscape sensitivity characteristics, called character regions, are found in the project area. Montane forests, densely populated with evergreen trees and undergrowth, are found at elevations of 2,850 m (9,350 ft.) and below. Montane meadows from 2,850 to 3,050 m (9,350 to 10,000 ft.) are predominantly vegetated by grasses, forbs, and wildflowers. Subalpine forests with scattered stunted trees and shrubs are found interspersed with alpine meadows near Frozen Lake from 3,050 to 3,180 m (10,000 to 10,450 ft.). Along about half of the route are alpine meadows above timberline at elevations above 3,180 m (10,450 ft.).

Montane Forest

The montane forest character region extends from the project beginning at KP 39.5 eastward 5.6 km (3.5 mi.) to KP 45.1, west of Top of the World Store. The scenic quality of the montane forest character region is low. Views contained by the forest offer little variety of rock forms, landforms, and color and texture. Short sections in the Beartooth Ravine offer unobstructed views of the Beartooth Falls, montane valleys, and distant mountain ranges.

Except for the Beartooth Ravine area, the landscape sensitivity of this region to man-made change is low to moderate. The Beartooth Ravine, one of the most scenic viewing locations, is highly sensitive to man-made change.

The external visibility of the road in this region is low from most locations because the forest blocks views of the road. The open space and light changes created by the road's path through the trees are discernible, however, from the Clay Butte Lookout, a popular side trip. The Beartooth Lake bridge is visible from most of Beartooth Lake.

Montane Meadow

The montane meadow region extends 8 km (5 mi.) from west of Top of the World Store to near Frozen Lake. The visual variety in all directions, and close proximity to water features provide high scenic quality along over half of the existing road in this region. The other portions of the existing road have a moderate scenic quality. In some locations, views of the road detract from the scenic quality.

Most of the montane meadow region has a moderate landscape sensitivity. Variations in landscape sensitivity are primarily due to the proximity of water.

About half of the montane meadow region has a moderate external visibility from sensitive viewing locations, with the other half equally divided between low and high visibility. The road in the montane meadow region is visible from some area lakes and trails.

Subalpine Forest

The subalpine character region begins at KP 53.1, near Frozen Lake, and continues east 2.1 km (1.3 mi.) to the western edge of the Beartooth Plateau. Steep road grades, numerous rock outcrops, and scattered dwarf evergreen trees typify the subalpine forest character region. This region is a transition between the montane meadow region below and the Beartooth Plateau, the alpine meadow region above. The scenic quality of this region is high because of unobstructed views of the character regions below and distant mountain ranges on most horizons. Landscape sensitivity is high because of steep topographic slopes, close proximity to wetlands, and a predominantly southwest orientation. Most of the subalpine forest region has a moderate external visibility, and the remainder has a low external visibility.

Alpine Meadow

The alpine meadow character region begins east of the subalpine region and continues 14.4 km (9 mi.) to the Montana/Wyoming state line. This road section traverses the Beartooth Plateau entirely above timberline. The scenic quality of the alpine character region is high along two-thirds of the existing road and moderate along the remaining one-third. The region offers views of high elevation peaks, unique geologic formations, large montane valleys, and alpine lakes. About half of the region has a high landscape sensitivity, with the other half having a moderate landscape sensitivity. External visibility of the road is limited due to its location on the plateau. Short sections of the road are highly visible from the two nearest sections of the Absaroka-Beartooth Wilderness to the north and northwest.

Existing Visual Quality Management

The SNF uses a Visual Management System to inventory the visual resources on the forest and to provide measurable management standards. A Visual Quality Objective for an area is determined after an analysis of landscape variety and sensitivity levels. Five Visual Quality Objectives, ranging from preservation to maximum modification, have been established. The Visual Quality Objective for the project area is Retention (Figure 41). To meet a Retention Visual Quality Objective, activities must not be visually evident to the average observer traveling on the road. Changes resulting from activities must repeat form,

line, color, and texture frequently found in the characteristic landscape. Changes in the qualities of size, amount, intensity, direction, and pattern must not be evident.

Environmental Consequences

Effects of the No Action Alternative

The road's existing scenic quality, landscape sensitivity, and visibility from sensitive viewing locations would not change in the No Action Alternative for any of the character regions. The road would remain a scenic highway, with the road remaining in its present narrow width. The artificial form created by the existing road and pullouts along the road would remain. Unreclaimed disturbed areas would remain.

Effects of the Build Alternatives

Short-term Effects During Construction. Effects on visual resources common to all build alternatives during construction would be the creation of dust, the presence of construction equipment, and nighttime lighting. Scenic quality would be diminished by the presence of artificial forms only related to the construction. Landscape sensitivity would remain unchanged. External visibility values would be diminished by the presence of airborne dust and night lighting. Construction would last 6 years. Effects on visual resources from construction would cease at the end of the 6-year construction period.

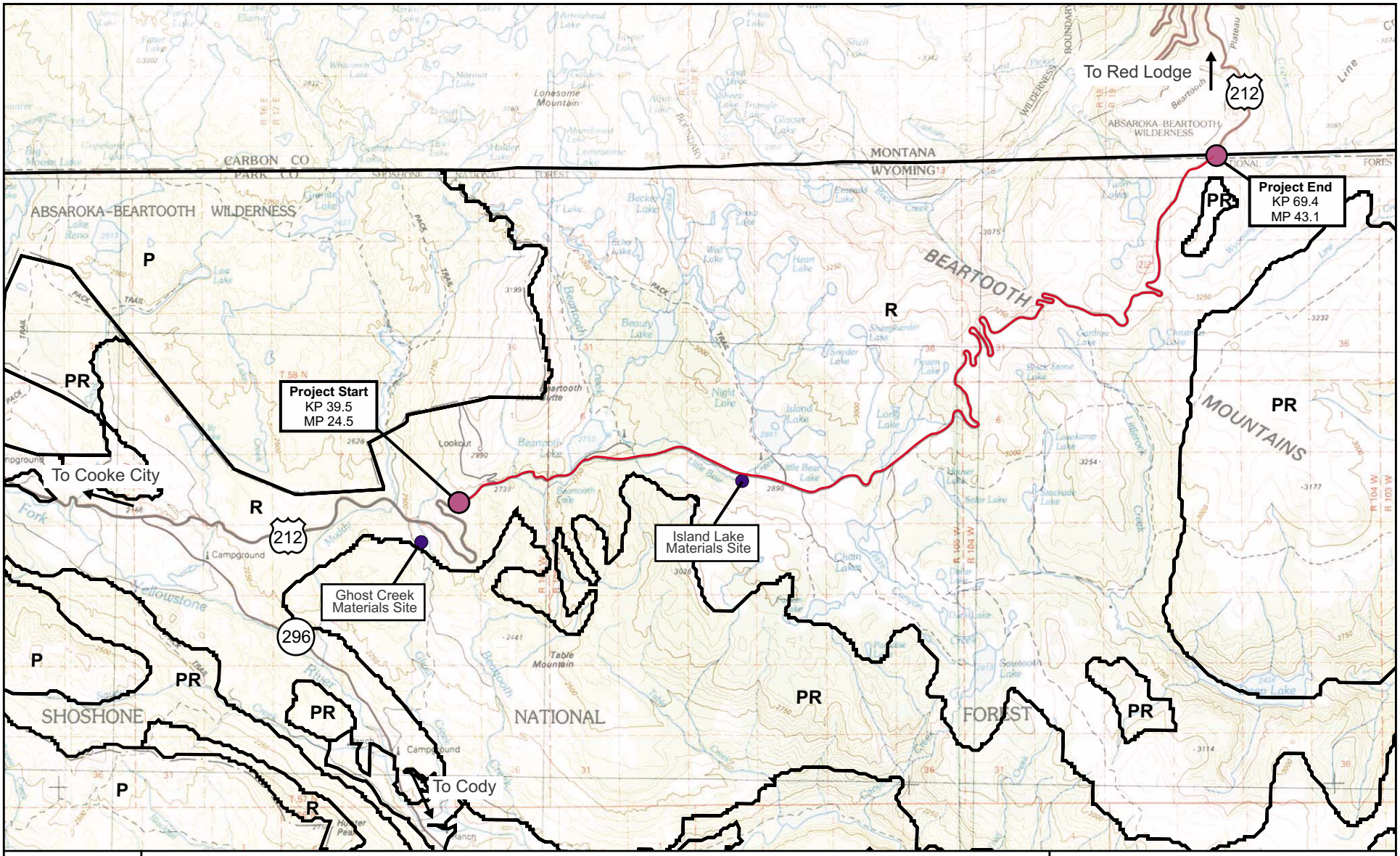
The presence of construction equipment and dust generated during earth-moving activities would distract from existing views. Viewers also may be distracted by nighttime construction lighting. Current nighttime lighting along the road exists only at the Top of the World Store, the two campgrounds, and from automobile headlights.

Long-term Effects of Road Construction. In each build alternative, widening the road pavement would enlarge or increase cut faces, fill slopes, retaining walls, drainage structures, and bridges. For all build alternatives, the visible impacts of the road on the landscape would increase. Examples of how the road might look are presented in Appendix H.

All build alternatives would follow the existing alignment closely throughout most of the corridor. Over 90 percent of Alternative 3 would follow the existing alignment closely. Although Alternatives 5 and 6 would have the most realignment areas, these two alternatives would follow the existing alignment closely in over 80 percent of the route. Alternatives 2 and 4 would follow the existing alignment closely between 80 and 90 percent of the route. Consequently, scenic quality, landscape sensitivity, and external visibility would be very similar to the existing road.

All build alternatives would reduce the number of existing pullouts. Access to pullouts would be improved. Pullouts would be enlarged as necessary to accommodate expected use. For example, Gardner headwall near the east summit is a popular skiing area. The abandoned road section would be used for a pullout to provide access to Gardner headwall.

Existing pullouts would be improved to include pedestrian walks or pull-in parking. Constructing larger parking areas would create an opportunity to safely view some of the most scenic landscapes along the road. None of the proposed pullouts with pull-in parking would be located in areas of high external visibility.



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Project start and end

Visual Quality Objectives

P - Preservation

R - Retention

PR - Partial retention

N

1/2 Inch = 1 Mile

Source: Shoshone National Forest Land and Resource Management Plan 1986

Figure 41
Shoshone National Forest
Visual Quality Objectives

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The scenic quality of the material sources sites would decrease in all build alternatives. Locations of materials sources are shown on Figure 41. The Ghost Creek material source site would not be visible from U.S. 212. The Island Lake moraine site would be immediately adjacent to the existing road and would be visible from the road in all build alternatives. Material would be removed through a shallow cut slope on the existing moraine. Views would improve along the road near the moraine by removing the material close to the road.

Scenic Quality. In the long term, all build alternatives except Alternative 3 would have higher scenic quality than the existing road (Table 27). Most of the increase in scenic quality would be the result of realignments at the Top of the World Store area. Scenic quality would increase because views from the new road would have more variety of land, rock and water forms than the existing road.

Although the existing grade would match adjacent grades and native plant materials would be used to revegetate disturbed areas, the reclaimed abandoned road sections would vary in line, color, and texture from the adjacent landscapes. The revegetated plant communities would be different from the adjacent plant communities. Areas where revegetation is less successful would be more visually intrusive and less likely to blend with the adjacent area. The most noticeable area would be at the Top of the World Store where in Alternatives 2, 5, and 6, the new alignment would cross the existing alignment. The existing alignment is fairly straight and, if abandoned and reclaimed, would be visually apparent at the intersections of the new alignments until the revegetated plant communities are similar to the adjacent plant communities.

Table 27. Number of 100-m road sections in each scenic quality category by alternative.

Scenic Quality Category	Alternative					
	1	2	3	4	5	6
Low	35	33	36	34	31	29
Moderate	94	86	93	76	83	79
High	173	180	169	180	179	190
% of High	57	60	57	62	61	64

Landscape Sensitivity. Alternatives 2, 3, and 5 would be located in areas of higher sensitivity than the other build alternatives (Table 28). Artificial forms, such as cut faces, fill slopes, retaining walls, and bridges, would be more likely to be present and visible in areas of high landscape sensitivity. Alternatives 4 and 6 would be in areas of low landscape sensitivity.

Table 28. Number of 100-m road sections in each landscape sensitivity category by alternative.

Landscape Sensitivity Category	Alternative					
	1	2	3	4	5	6
Low	63	73	63	61	75	75
Moderate	155	142	155	159	141	151
High	84	84	80	70	77	72
% of High	28	28	27	24	26	24

External Visibility. Road locations with high external visibility would distract from scenic views at sensitive viewing areas, such as camping and picnic grounds, lakes, wilderness, trails, and other roads. All build alternatives would be more visible than the existing road from sensitive viewing locations (Table 29). Most of the increased visibility would be the result of larger cuts and fills in the alpine and subalpine areas. In all build alternatives, the Beartooth Ravine, Frozen Lake, and Bar Drift realignment options would not affect the external visibility of the road. Most moderate and high ratings of external visibility in all build

Table 29. Number of 100-m road sections in each external visibility category by alternative.

External Visibility Category	Alternative					
	1	2	3	4	5	6
Not Visible	60	66	63	56	65	66
Low	60	28	27	28	24	23
Moderate	158	156	159	165	158	160
High	24	49	49	43	46	49
% of High	8	16	16	15	16	16

alternatives are because the road would be visible from the Absaroka-Beartooth Wilderness.

Cumulative Effects. Other foreseeable activities in the area include the widening of 13.5 km (8.4 mi) of U.S. 212 between the northeast entrance to YNP and the Montana/Wyoming state line near Cooke City. This project would have similar visual impacts as the proposed project, with a wider road increasing the amount of artificial form.

Resource Commitments. Larger cuts and fills in all build alternatives would alter the visual landscape and would be an irreversible commitment of resources. Changes in visual quality from other road construction activities would be an irretrievable commitment of resources. Disturbed areas would be mitigated by revegetation, but would have different lines, colors, and textures than the adjacent landscape.

Proposed Mitigation

Mitigation of Short-term Effects. For all build alternatives, views from some locations during the construction period would be altered by the presence of construction vehicles, equipment, personnel, and emerging new road facilities. This impact would be considered adverse by some viewers and would be an unavoidable consequence of project construction. The following mitigation measures would reduce impacts on visual resources during construction:

- Institute dust control procedures throughout the construction process.
- Locate staging areas and equipment and material storage facilities at sites with minimum visibility from the road, where possible.

Mitigation of Long-term Effects. An FHWA representative with experience in landscape architecture and revegetation would be on-site to coordinate implementation of the landscaping and revegetation plan.

For all build alternatives, the road would alter views of some locations in the project area. The following mitigation measures would minimize the contrasts between the road and its surroundings.

Apply to Soil Cuts:

- Smoothly transition the top of cut faces into undisturbed ground by rounding, to diminish visible edges. Vary the size and shape of the rounding to match the adjacent landform and preserve selected trees and/or rocks.
- Preserve existing rock outcrops outside of clear zone and within construction limits to vary cut face slope, composition, color and texture. Undulate or roughen cut face to match adjacent rock outcrops and landforms.
- Preserve selected existing individual trees, shrubs and/or rocks outside clear zone and within construction limits for the same reasons as stated above.
- For placement of surface stones, use only stones salvaged from the ground surface prior to construction.
- Revegetate by seeding and/or planting with native plants.

- Place dry-stacked rock against cutslopes in select locations to avoid laying back slopes and to minimize erosion.

- Selectively place natural appearing, uncut felled trees, tree stumps and rocks onto cut face surfaces. Place these materials in patterns and at densities similar to the undisturbed adjacent forest. Felled trees with rock supports and staking may be located to enhance erosion control (not applicable in all areas).

Apply to Rock Cuts:

- Manipulate blasting patterns to create rock surfaces, terraces, and ridges similar to undisturbed rock faces and outcrops.
- Shape cut faces to blend with adjacent undisturbed rock faces.
- Create soil pockets within the terraces and ridges of cut faces to accommodate and promote revegetation. Locate, size, and shape soil pockets to replicate the planting areas of undisturbed rock faces.

Apply to Fills:

- Construct new fill slopes using terraces, native stones and native plants. The size, shape, and location of terraces should be similar to the adjacent undisturbed landforms. The density and placement of stones and plants also should be similar to the density and placement of adjacent undisturbed stones and plants.
- Connect new fills to adjacent undisturbed slopes by developing similar landforms and drainage patterns.
- Revegetate by seeding and/or planting with native species.
- Compose terracing, surface stone placement, and revegetation similar to adjacent undisturbed ground surfaces and land forms.

Apply to Retaining Walls:

- Treat exposed and visible concrete retaining wall faces and tops with form liners or stone facing to be similar to the historical bridge abutments, historical roadway retaining walls, and/or the undisturbed boulder field surfaces. This treatment may not be applicable in all talus locations.
- Treat mechanically stabilized earth wall face and tops with pre-cast concrete panels or dry-laid stone. Pre-cast panels should replicate the historical bridge abutments, historical roadway retaining walls, and/or the undisturbed boulder field surfaces.

Apply to Roadway Facilities:

- Use rock excavated within the project construction limits for aggregate base.
- Use asphalt-coated, stained, or painted culvert pipe end sections to diminish their visibility in the most visible locations.
- Use alternative materials for guardrails to minimize reflectivity and eliminate the silver color of galvanized steel guardrails.
- Use wood or alternative materials for guardrail posts to minimize reflectivity and provide a color that blends with the surrounding plant colors.
- Select guardrail designs that minimize the width of the metal exposed to view and allow snow to be ejected from the road through the rail.

References

Holdeman Landscape Architecture. 2002. Final Visual Assessment Report. Portions of U.S. 212 (FH4), The Beartooth Highway, Park County Wyoming. Prepared for the Federal Highway Administration-Central Federal Lands Highway Division, Lakewood, CO.

Shoshone National Forest. 1986. Land and Resource Management Plan. Cody, WY.

3.9 Recreation Resources

Affected Environment

The project area passes through the SNF in Wyoming. Recreation opportunities on National Forest lands along the road include hiking, fishing, camping, wildlife viewing, bicycling, four-wheeling, scenic driving, horseback riding, cross-country skiing, snowshoeing, and snowmobiling (Table 30). Accessing these recreation activities is a major reason that individuals use the Beartooth Highway (MK Centennial Engineering, Inc. 1999a). The road also offers access to the Absaroka Beartooth Wilderness, the North Absaroka Wilderness, and the northeastern entrance to YNP.

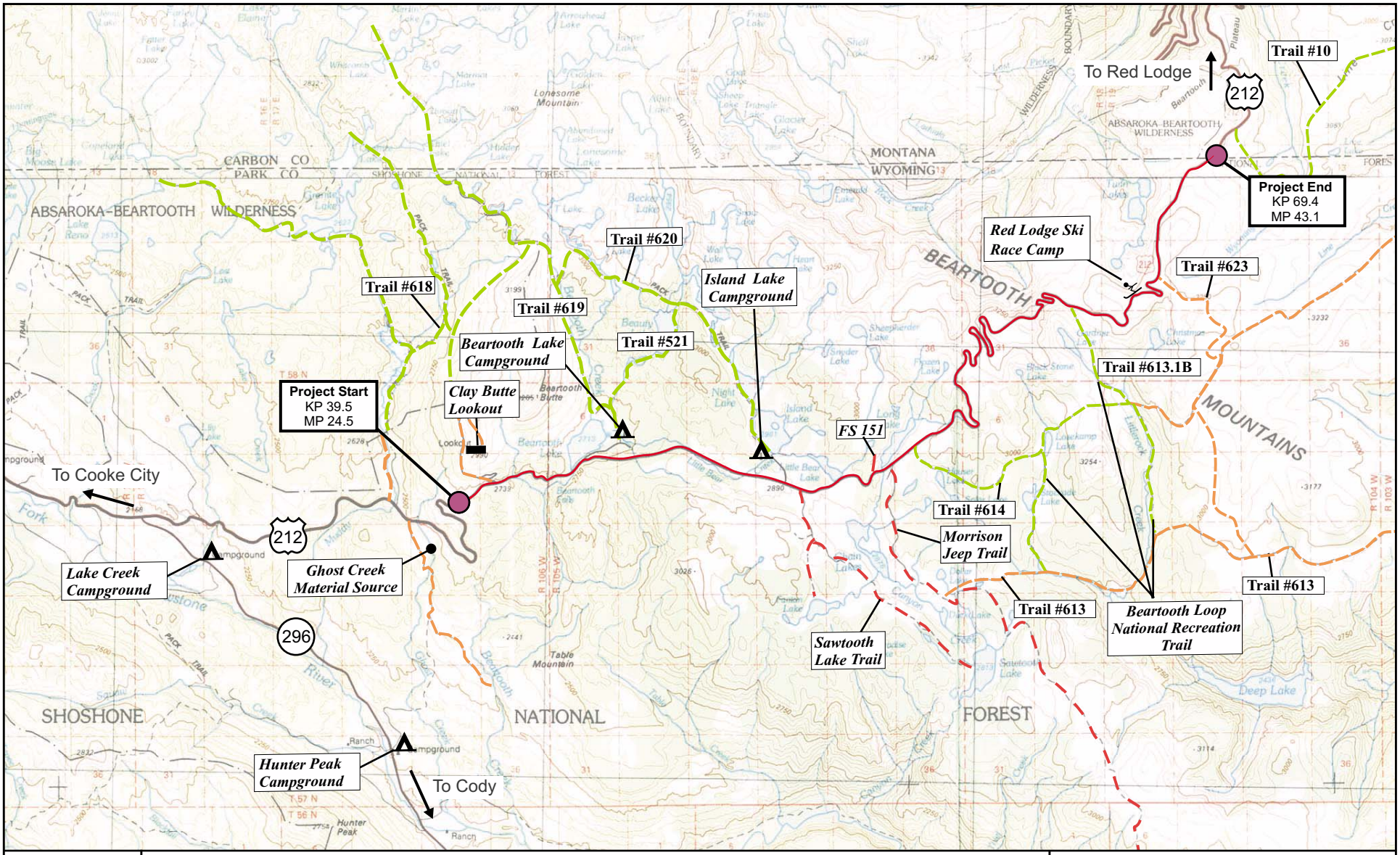
Developed Recreation

Two campgrounds, Beartooth Lake and Island Lake, are located within the project area (Figure 42); 11 other campgrounds are located along the road between Red Lodge and Cooke City, Montana. The campgrounds all have parking spurs, tables, fire rings, and vault toilets. Island Lake and Beartooth Lake campgrounds have boat launches. Island Lake Campground has 21 campsites and Beartooth Lake Campground has 20 campsites. The campgrounds do not open until mid- to late June, depending on snow conditions. Based on campground fee data, campground use along the Beartooth Highway increased by about 4 percent annually between 1996 to 1999 (Bree 1999).

The Fox Creek Campground is the preferred workcamp location. The campground is located about 11 km (7 mi.) southeast of Cooke City, Montana near the confluence of Fox Creek and the Clarks Fork Yellowstone River. Campground amenities include 27 campsites, pit toilets, and water pumps. The campground is one of the least used campgrounds along the road (Reynolds 2001). A spring across U.S. 212 is piped under the road and then flows by gravity to the campground. The spring water does not meet current standards for potable water and is no longer used. The campground is more forested than other campgrounds along the road, which leads to poor air circulation. Because of the overland water flow and poor air circulation, mosquitoes are a problem during most of the camping season.

Table 30. Recreation opportunities accessed via the Beartooth Highway.

Recreation Resource	Primary Activities
USFS Managed Resources	
Wilderness	Hiking, camping, paddling, fishing, hunting, cross-country skiing, and snowshoeing.
National Forest	Hiking, camping, fishing, hunting, cross-country skiing, scenic driving, horseback riding, mountain biking, and snowmobiling.
Privately Managed Resources	
Top of the World Store	Provides traveler services.
Red Lodge Race Camp	Private skiing race camp.
Hunting and horseback outfitting	Several outfitters operate near the Beartooth Highway.



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Recreation Trail closed to motorized vehicles

Recreation Trail open to motorized vehicles

Jeep Trail

Campground

Source: Shoshone National Forest Land and Resource Management Plan 1986

1/2 Inch = 1 Mile

N

Figure 42
Recreation Resources

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Many jeep, hiking and horseback riding trails originate from the road, but no pedestrian trails parallel the road (Figure 42). One of the most heavily used trails is the Beartooth Loop National Recreation Trail. This 23-km (14-mi.) trail is used for both hiking and horseback riding (ERO Resources Corp. 2001c). No trail use data are available for the major trails within the project area.

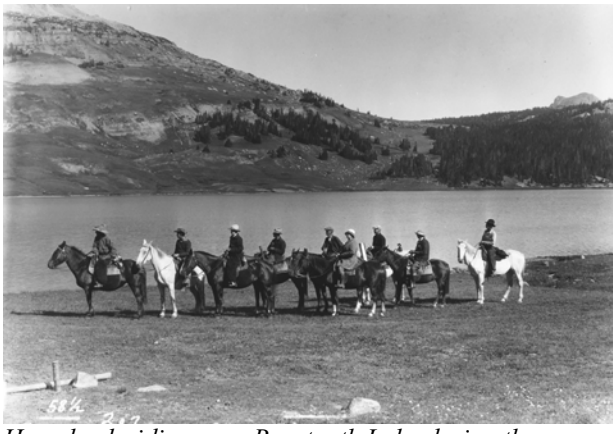
One of the more popular developed recreation sites along the Beartooth Highway is the Clay Butte Lookout Tower. The Lookout Tower is located about 0.8 km (½ mi.) northwest of Beartooth Ravine and is a short, 4-km (2.5-mi.) drive off the road. Built in 1942, the former fire lookout tower stands at 2,990 m (9,800 ft.) and provides an expansive view of SNF, Beartooth Butte, Beartooth Lake, as well as the Beartooth Highway. Other popular developed recreation facilities along the road include a private downhill ski racing camp just east of the road's easternmost summit (Figure 42). The Top of the World Store, located between Beartooth and Island Lakes, sells food, gasoline, and other traveler supplies, and is open seasonally from about Memorial Day until the Beartooth Highway closes in October.

Dispersed Recreation

Dispersed recreation is recreation that occurs outside a developed recreation site. The project area is used for dispersed recreation, including hiking, horseback riding, fishing and hunting, camping, mountain biking, cross-country skiing, snowshoeing, and use by off-road vehicles such as four-wheel drive vehicles, all terrain vehicles, dirt bikes, motorcycles, and snowmobiles. Bicyclists use the travel lanes because the road has no shoulders or adjacent bike trails. Dispersed camping areas occur in a few locations along the road.

Hiking and Horseback Riding. The USFS is responsible for maintaining hiking and horseback riding trails located in SNF. One of the most heavily used trails is the Beartooth Loop National Recreation Trail (#613.1B). It originates at the Gardner Lake trailhead, just east of Gardner Lake. It is a National Recreation Trail under the National Trail System Act. The trail is 21.6 km (14.4 mi.) long and offers views of the alpine portion of the Beartooth Plateau. The Hauser Lake trail (#614) originates east of Long Lake and connects to Beartooth Loop National Recreation Trail near Losekamp Lake. The Deep Lake trail (#623) originates near the Albright Curve, east of the Red Lodge Ski Race Camp. Several other popular trails are located along the road, mostly along the western portion of Segment 4 (Figure 42).

Many informal social trails also are present along the road between Clay Butte Lookout and Beartooth Ravine, at Beartooth Campground and the Top of the World Store, and near Island Lake Campground. These social trails are not formally maintained by the USFS, and often are the result of individuals wandering from pullout locations along the road.



Horseback riding near Beartooth Lake during the 1950s.

Photo © Flash's, Red Lodge, MT

Fishing and Hunting. The SNF includes about 1,600 km (1000 mi.) of perennial streams and 500 lakes, and offers a variety of fishing opportunities. Popular game fish species include cutthroat, rainbow, brown, golden, and brook trout. The Wyoming Game and Fish Department manages fishing, and hunting in the project area.

Off-Road Vehicles. In general, mapped trails in the project area are closed to off-road vehicles. Exceptions include Trails 613, 623, and portions of 618, 619, and the Beartooth Loop National Recreation Trail.

Scenic Driving. The road goes from Red Lodge through CNF and the northern portion of the SNF, then through GNF and into the northeast entrance of YNP. The USFS designated the road in 1989 as the Beartooth Scenic Byway under the Forest Service Scenic Byway Program. In 2000, the Wyoming portion of the road was designated an All-American Highway. Crossing the west summit of Beartooth Pass at 3,337 m (10,947 ft.), the road is one of the highest and most scenic routes in the U.S., and affords spectacular views of the Absaroka and Beartooth Mountain Ranges. Many visitors come for the primary purpose of driving the road for pleasure and adventure.

Pullouts and parking areas provide travelers with a space to pull off and enjoy the scenery. The FHWA completed an inventory of all pullouts located along the road, regardless of the pullout's location or condition. For the purposes of the survey, an intersection with forest roads was considered a pullout. The survey identified 114 pullouts along the road. Most existing pullouts were not planned, but instead were formed as vehicles pulled off the road in the same locations over time. Some of the pullouts are poorly located, sized, and constructed. Because of these problems, these pullouts present a safety hazard. Safety issues include pullouts on the opposite side of the road from an attraction, requiring visitors to cross the road where sight distance is inadequate, and undersized parking areas causing vehicles to block the road. Examples of such pullouts are between Beartooth Lake and Beartooth Falls. Additionally, few of the pullouts offer interpretive signs or materials. Additional information about recreation resources is found in the Final Recreation Report (ERO Resources Corp. 2001c).

Specially Designated Resources

Wilderness and Wilderness Study Areas. The Absaroka-Beartooth Wilderness is located near the road and the North Absaroka Wilderness is southwest of the road. The High Lakes Wilderness Study Area is 91 m (300 ft.) north of the highway near Beartooth Pass. The highway provides recreational access to the Absaroka-Beartooth Wilderness. The Absaroka-Beartooth Wilderness boundary is within 300 m (1,000 ft.) of the road immediately north of the Montana/Wyoming state line at KP 69.4.

About 9,620 ha (23,750 ac.) of the 382,725-ha (945,000-ac.) Absaroka-Beartooth Wilderness are located on the SNF. The area is well known for lake and stream fishing and also provides habitat for mountain goats, bighorn sheep, moose, elk, and other wildlife.

The Wilderness Act directs the USFS to protect the natural character of the wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilderness areas. In the project area, the Absaroka-Beartooth Wilderness, the High Lakes Wilderness Study Area, and the North Absaroka Wilderness have the attributes defined in the Wilderness Act. These attributes are applied to the conditions inside the wilderness boundaries. Although the experience of wilderness visitors might be affected by activities outside the

wilderness boundary, the Wilderness Act does not require that adverse effects associated with those activities be mitigated.

Roadless Areas. Two roadless areas are adjacent to the road corridor. The South Beartooth Highway Roadless Area is directly south of the road through most of the project area within the SNF. The Line Creek Roadless Area is on the east side of the road, north of the Montana/Wyoming state line within the CNF. Proposed uses of the roadless areas are subject to resource management and environmental statutes, such as NEPA and the Endangered Species Act. Under the CNF Plan (CNF 1987), all the Roadless Area adjacent to the road (in Montana) is managed as a Research Natural Area (RNA). In the SNF (Wyoming), the Line Creek RNA is north and east of the road from Albright Curve to the Montana/Wyoming state line. RNAs are protected under SNF and CNF Plans for the purposes of maintaining biological diversity, conducting research and monitoring, and providing environmental education opportunities (SNF 1986; CNF 1987).

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not affect existing recreation opportunities available along the road, but would not offer needed improvements in pullouts and interpretation specified in the SNF plan and the Corridor Management Plan. The already poor road conditions would continue to discourage bicycling and pedestrian use of the road shoulder.

Traffic on the road is expected to continue to increase in the No Action Alternative. Demand for outdoor recreation opportunities also would continue to increase. Lack of maintenance and continued road deterioration may preclude some current road users from using the road.

The 114 existing pullouts (the most of any alternative) would remain available to motorists for scenic viewing and accessing recreational amenities such as way trails, fishing, camping, and picnicking areas. The poorly located, sized or constructed pullouts would continue to pose a safety hazard to users, and vehicles using them would degrade adjacent resources.

At Beartooth Lake Campground and Island Lake Campground, noise associated with future traffic volumes would increase by 3 or 4 decibels (see *Noise* section. Where the boundaries of Absaroka-Beartooth Wilderness, High Lakes Wilderness Study Area, South Beartooth Highway Roadless Area, and the Line Creek Roadless Area are close to the road, noise associated with future traffic volumes also would increase by 3 or 4 decibels (also see *Noise* section).

Effects of the Build Alternatives

In all build alternatives, the recreation experience for most visitors would improve in the long term. Travel lanes and shoulder widths would increase allowing drivers to more readily enjoy the scenery. For visitors interested in adventure driving, their experience may diminish. Major intersections, such as campground turnoffs, would be upgraded to improve sight distance where needed.

The SNF manages the section west of Long Lake as a recreation complex, with more intensive recreational activity, including pedestrian and bicycle use. All of the developed recreation sites along the road are found west of Long Lake. In the western section, travelers are more likely to stop along the road shoulder, use bicycles, motorcycles and all-terrain vehicles in family groups and engage in roadside viewing and related activities.

These activities involve frequent stops, slow-moving motorized and non-motorized vehicles, and a variety of user ages. Winter recreational use is also important as the road from Cooke City to Long Lake is a popular snowmobile destination. Low snow years and the "shoulder" seasons (early June and early October) of snowmobiling cause a mix of snow craft adjacent to the road and full size vehicles on portions of the road. Alternatives 2 and 4, which would have a 1.2-m (4-ft.) shoulder west of Long Lake, and Alternative 6, which would have a 0.9-m (3-ft.) shoulder west of Long Lake, would adequately accommodate these uses in conjunction with through-traffic use of the roadway. Alternatives 3 and 5, which have a 0.6-m (2-ft.) shoulder west of Long Lake, would not accommodate this traffic mix as safely.

In all build alternatives, pullouts would be sized, located, and constructed more appropriately, which would improve both visitor experience and safety. Pullouts were located in cooperation with the SNF and considered environmental constraints, such as wetlands or wildlife crossings. Although the build alternatives would have fewer pullouts than the No Action Alternative, nearly all the existing pullouts not incorporated into the build alternatives were poorly located or adversely affecting adjacent resources.

Larger parking areas in some locations would enhance the visitor experience by decreasing congestion, such as near the Gardner Headwall during early June. Interpretive signage and materials would be installed at several parking areas. All pullouts and parking areas would be designed to comply with the American Disabilities Act. Conceptual designs of selected pullouts and interpretive areas are presented in Appendix G.

The relatively high number of pullouts in Alternative 2 would provide more opportunities to experience scenery, way trails, and lakes and streams along the road (Table 31). Alternatives 3 and 5 with fewer pullouts would provide for fewer of these opportunities.

Table 31. Number of proposed pullouts by alternative.

Alternative	Number of Pullouts
1	114
2	78
3	36
4	62
5	31
6	66

Alternative 2 would use alignment options with the slowest design speeds, and the highest number of design exceptions. These factors would create more opportunities for motorists to safely pull off the road to enjoy scenic viewing and other recreation opportunities along the road. All other build alternatives would accommodate recreation uses to a lesser degree than Alternative 2, but to a greater degree than the No Action Alternative.

All build alternatives would affect visual resources. For all build alternatives, the visible impacts of the road on the landscape would increase. For some viewers, the road is an artificial form in the landscape and generates a distraction from scenic views. For other viewers, the road creates visual variety and exemplifies historic and/or state-of-the-art engineering techniques and practices. All build alternatives would follow the existing alignment closely throughout most of the corridor. Consequently, visual resources would be very similar to those of the existing road. All build alternatives would be more visible than the existing road from sensitive viewing locations (see *Visual Resources* section for additional information).

During construction, temporary road closures, more trucks and construction traffic on the road, and dust would inconvenience recreationists such as bicyclists, hikers, and campers near the road. Recreational use along the road may decrease during the 6-year construction period. Some pullouts would no longer be accessible. These impacts would be short term and limited to the duration of construction activity in the area. Road construction delays also could discourage road use during construction. Access to all recreational amenities, with the exception of the Fox Creek Campground, would remain during and after construction.

During the 6-year construction period, Forest Road 118 would be used to provide access to the Ghost Creek materials source and staging area. Public access on the road would be maintained during construction. Forest Road 118 provides access to private property south of the Ghost Creek materials source.

During the 6-year construction period, the Fox Creek Campground would be closed to public use and would be used as a workcamp. Closure of the campground would inconvenience recreationists who currently use the campground. The Fox Creek Campground is one of the least used campgrounds along the road, and other nearby SNF campgrounds, such as Crazy Creek, or campgrounds on the GNF, would provide ample camping opportunities during the construction season. When the campground is reopened to public use, campground improvements would benefit campers.

Noise would be generated during construction at the staging areas and material sources. Campground users would be most affected by the increased noise. Construction noise would be generally audible to very audible at the Beartooth Campground, and very audible at the Island Lake Campground. Construction noise may decrease campground use during the 3-year construction period of the road section near the campgrounds. Construction noise levels in the campgrounds would be lower when the eastern road section is under construction. Although construction noise would cease at the end of the 6-year construction period, noise from increased traffic volumes may still influence campers. At the Beartooth and Island Lake Campgrounds, noise associated with future traffic volumes is expected to increase by 3 or 4 decibels (see *Noise* section).

No construction would occur in the Absaroka-Beartooth Wilderness, High Lakes Wilderness Study Area, the South Beartooth Highway Roadless Area, or the Line Creek Roadless Area. Where these areas are close to the road, noise associated with future traffic volumes would increase by 3 or 4 decibels in all build alternatives (see *Noise* section). Predicted noise levels would be higher during construction by 25 to 35 decibels. Predicted noise levels would be highest close to the road. Predicted noise levels would be similar to existing levels between 10 to 20 km (6 to 12 mi.) from the road. Actual noise levels probably would be less than predicted noise levels because of topographic changes. Recreationists seeking opportunities for solitude in the wilderness and roadless areas would be adversely affected. The increased noise would be short term and would cease at the end of the 6-year construction period.

Cumulative Effects. In 2004, the FHWA will begin reconstructing U.S. 212 from YNP to the Montana/Wyoming state line near Cooke City. Construction is expected to continue for 4 years, through 2007. This construction, combined with the proposed project (Segment 4), may displace recreation use along U.S. 212 between 2005 and 2007.

Resource Commitments. No build alternatives would result in an irreversible commitment of resources. Displacement of recreational use because of temporary road closures, more trucks and construction traffic on the road, noise, and dust would be an irretrievable commitment of recreation resources.

Proposed Mitigation

The FHWA would consider limiting nighttime construction adjacent to the campgrounds and Top of the World Store, when they are open. The decision would be made in cooperation with the SNF based on the type of construction required by the selected alternative. Access to the Top of the World Store would be maintained at all times.

To assist local business owners and the traveling public with the delays and closures, the FHWA would develop a traffic control plan in coordination with those communities that may be most affected by the reconstruction work, such as Red Lodge. The FHWA also would develop a public information program as part of traffic management during construction. The FHWA would use various forms of communication, such as ads, signs, newsletters, and brochures via radio, TV, and the Internet, to inform road users and local business owners about the construction schedule and progress. Specific partial day or nighttime road closure times would be announced well in advance to assist motorists with trip planning.

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3.10 SOCIOECONOMIC RESOURCES

Affected Environment

The socioeconomic study area includes the project area, the town of Cody, and Park County in Wyoming. The study area also includes the towns of Red Lodge, Cooke City, and Silver Gate, as well as Park and Carbon Counties in Montana. Cooke City and Silver Gate are located in the southeastern corner of Park County, Montana. Because these towns represent a very small portion of Park County, Montana, county data is not discussed. Red Lodge's economy depends primarily on the business generated by tourism on the road, in YNP, in the SNF and CNF, and in the Absaroka-Beartooth Wilderness. While tourism associated with the road is important to Cooke City and Silver Gate, these towns also receive traffic via WY 296 and snowmobile traffic in the winter. The road is one of many visitor amenities near Cody, and is not a primary visitor attraction for Cody visitors. Only 4 percent of trips to the road begin in Cody (MK Centennial Engineering, Inc. 1999a).

Population and Demographics

Red Lodge is the largest town in Carbon County, with a population of 2,177 (Census Bureau 2001a). From 1990 to 2000, Red Lodge's population increased from 1,958 to 2,177 (about 1 percent annually) (Census Bureau 2001a). Carbon County's population was estimated at 9,552 in 2000 (Census Bureau 2001b), and is projected to exceed 10,000 by 2005 (CEIC 2001a). Carbon County's population has been gradually aging, with many people over 65 residing in Red Lodge in 1990 (Nellis 1995).

Recent growth trends most likely are attributable to newcomers, including retirees, young urban professional families, and wealthy urbanites. Area attractions include rural and small town character, natural scenery, and recreational opportunities (CNF 1996).

In 2000, the population of Cooke City and Silver Gate was 140 (Census Bureau 2001a). Neither town is incorporated and no population projections are available. Like Red Lodge and Carbon County, Cooke City experiences substantial out-migration of young people after high school (Bernard 1999; CNF 1996).

From 1990 to 2000, the Park County, Wyoming population grew by about 1 percent annually, from 22,950 to 25,789 (Census Bureau 2001b). During the same period, Cody's population had a similar percentage increase (from 7,897 to 8,835) (Census Bureau 2001a). Park County, Wyoming is projected to grow about 1 percent annually through 2007 (Bureau of Economic Affairs 1999).

Employment and Income

Employment. In 2000, the average civilian labor force in Carbon County was 4,883 (CEIC 2001b). Historically, the unemployment rate has been at or below the statewide average. Tourism directly and indirectly employs about one-third of all Carbon County workers, with a high concentration of tourism-related services offered in Red Lodge.

In 2000, unemployment in Carbon County was about 5 percent (CEIC 2001b). In 1999, about 19 jobs were available in the heavy construction industry (Census Bureau 2001c). In 2000, unemployed workers in the heavy construction industry were estimated at 1 (Census Bureau 2001c).

In 1997, the services, wholesale and retail trade, and government sectors in Park County, Wyoming accounted for nearly 75 percent of total employment. From 1990 to 1999, the services, and finance, insurance, and real estate employment sectors had the most growth. Employment in mining and oil and gas fell substantially during the same period (Cody Chamber 1999). In 2000, unemployment in Park County was about 4 percent (Wyoming Department of Employment 2001). In 1999, as many as 216 people were employed in the heavy construction industry (Census Bureau 2001c). In 2000, unemployed workers in the heavy construction industry were estimated at 12 (Census Bureau 2001c).

Workers on break during the original road construction.
Photo © Flash's, Red Lodge, MT

An additional activity that provides employment is the issuing of film permits by SNF. Automobile commercials are filmed approximately twice per summer on portions of the road. The most commonly issued permit allows 31 to 60 people in a crew that remains in the study area between two and five days. Local businesses supply consumer goods and personnel to these efforts (Watson 2001).

Income and Wages. Median per capita personal income in Carbon County increased from $14,171 in 1989 to $20,889 in 1999, reflecting an average annual growth rate of 4.0 percent (Bureau of Economic Affairs 2001). About half of personal income was generated through transfer payments, dividends, interest, and rent, of which retirees accounted for a major share. In Carbon County, wages associated with food and lodging were about 13 percent of the total private earnings in 1999. Wages associated with tourism, however, increased more than average between 1989 and 1999.

In Park County, Wyoming, median per capita personal income was $16,242 in 1989 and grew to $25,965 in 1999, reflecting an average annual change of 4.7 percent (Bureau of Economic Affairs 2001). In 1999, per capita income in Carbon County was lower than state-wide per capita income; a similar situation occurred in Park County, Wyoming.

Tourism

The road and outdoor recreation opportunities in the Beartooth Mountains account for most summer tourism in Carbon County and Red Lodge (CNF 1996). The Red Lodge area provides most commercial lodging in Carbon County. Summer occupancy rates, which have increased, average about 90 percent, while winter occupancy rates have remained at about 50 percent (CNF 1996).

Two high seasons for tourism occur in Cooke City—one in summer and the other in winter. The summer season starts around the beginning of June and ends around the middle or end of September. The winter high season associated with snowmobile traffic begins in November and ends around Easter. No services are open in Silver Gate in the winter, so Cooke City provides all accommodations and other services for winter tourists and residents (Bernard 1999).

Community Services

Red Lodge has two grade schools, one middle school, and a high school. All are near capacity (CNF 1996). The school in Cooke City serves the Cooke City-Silver Gate area, and offers kindergarten through eighth grade education in a one-room schoolhouse that was remodeled in the mid-1990s. Currently, about a dozen children attend the school. In the winter, attendance may drop to about 10. High school students who reside in Cooke City could board in Gardiner during the school year. Most high school graduates leave Cooke City (Bernard 1999).

The Carbon County Sheriff is based in Red Lodge. The number of serious criminal offenses in Carbon County increased from 143 in 1990 to 177 in 1994, although the crime rate is below statewide rates (CNF 1996). Very little crime occurs in Cooke City and Silver Gate, and most incidents involve tourists. The park ranger assigned to the northeast entrance of YNP provides the law enforcement in Cooke City. The Park County deputy sheriff is located 52 miles away in Gardiner, Montana. According to the State of Wyoming Attorney General's Office, there were 1,136 arrests in Park County in 1999, with 10 percent of these arrests attributed to burglary or theft (Wyoming Division of Criminal Investigation 2001).

Red Lodge also has a full range of fire and emergency services. The Beartooth Hospital and Health Center provides acute care and emergency services. Additional medical facilities for minor injuries include the Mountain View Medical Center and Red Lodge Clinic (Norby 2001). Emergency medical facilities also are located in Cody.

Housing Availability

Very little rental housing is available in the project area. Red Lodge, Montana, and Cooke City, Montana are the two towns closest to the project area. In Red Lodge, there are approximately 325 motel rooms, 200 to 300 apartments, and 10 homes available for rent (Parsons 2001). At any given time, between 5 and 10 percent of those units would be available for rent; the remaining units would be occupied. In Cooke City, there are very few rental units available. Approximately 188 motel rooms are available for rent. Apartments and homes for rent in Cooke City are very limited.

Attitudes Toward Growth and Development

While some businesses in Cooke City, Silver Gate, Red Lodge, and Cody are unhappy with the temporary slowdown that would be associated with construction on the road, there appears to be some agreement that the long-term improvements are positive (Bernard 1999; Cline and Fears 1999; Hoffman 1999). Local residents of Carbon County and Red Lodge identified economic development, recreation, and tourism as some of the most important community needs (Double-Tree, Inc. 1989).

Environmental Consequences

Effects of the No Action Alternative

In the No Action Alternative, economies in the study area would risk losing tourism because of the road's continued deterioration. Because tourism employs about a third of all Carbon County workers and the road accounts for most summer tourism in Carbon County and Red Lodge, it is expected that as the road continues to deteriorate, Red Lodge's economy would be at the greatest risk of decline. Services associated with food and lodging, which represent about 13 percent of earnings for Carbon County, would be reduced if tourism associated with scenic driving on the road decreased because of poor road conditions. Because Cooke City can be accessed from WY 296 and the high volumes of winter snowmobile traffic, Cooke City would be at less risk of an economic decline. The No Action Alternative is unlikely to adversely affect Cody's economy.

Increased traffic volumes over the next 20 years would increase the number of vehicular accidents. Consequently, more services associated with accident investigation would be needed to respond to the increased accidents.

Effects of the Build Alternatives

Population and Demographics. The build alternatives would result in a small, short-term increase in population in Park and Carbon Counties in Wyoming and Park County, Montana due to the employment of about 80 seasonal construction workers. Because the number of unemployed heavy construction workers available in the project area is low, most of the workers would come from outside the counties during summer construction periods. The construction workforce would represent a small population increase, which would not adversely change the area's demographics. The project would not affect neighborhood or community cohesion.

Employment and Income. The build alternatives would result in increased expenditures for living and construction expenses associated with jobs and construction on the road. For workers that live in the study area, the income earned would remain in the socioeconomic study area. For workers that reside outside the study area, a significant part of their earned income would go back to the area where they reside.

Local businesses providing lodging, meals, equipment, fuel, operating supplies and other consumer goods and services would benefit from increased expenditures. These expenditures would positively affect the local and regional economies both directly and indirectly. Direct economic benefits include dollars spent in the local economy by project workers. Local merchants and other providers of goods and services would benefit. Indirect or secondary economic benefits also would be associated with the build alternatives. Indirect income results when dollars from an initial purchase of goods and services are spent again. For example, for every paycheck dollar spent on local gasoline or groceries, a portion is spent again by the receiver for other goods and services. Direct and indirect expenditures also would boost local and state taxes.

An early "trackhoe" during the 1930s road construction.
Photo © Flash's, Red Lodge, MT

Automobile marketers often obtain film permits from SNF and film TV advertisements on the Beartooth Highway within the project area. The consumer spending associated with these activities, including lodging, meals/catering, fuel, and other consumer goods, would be suspended during construction (Watson 2001).

Traffic delays associated with construction activities on the road may adversely affect tourism by decreasing visitation in and around Red Lodge and Cooke City as well as at the Top of the World Store during the busy summer tourist season. Business at the Top of the World Store may decrease. Visitors may choose to access YNP through the north entrance at Gardiner or the east entrance at Cody to avoid delays along the road. Due to the numbers of variables involved, the magnitude of these effects cannot be quantified.

Traffic delays typically would be limited to 30-minutes during daytime hours during peak tourist season (July 15 through August 15). Longer delays up to an hour would be in effect during other times the road is open. Longer delays or partial day closures may be needed for certain construction operations, such as rock blasting.

After the road is constructed, the economies of Red Lodge, Cooke City and Cody would be beneficially affected by continued tourism associated with the road. Local businesses providing lodging, meals, equipment, fuel, operating supplies and other

consumer goods and services would benefit from continued expenditures.

Tourism. In the short term, tourists traveling the road would experience delays and limited closures associated with construction. In the long term, the road would be significantly improved, which would provide a more enjoyable experience for the increasing number of tourists who travel the road each year. For tourists who visit the Beartooth Highway for adventure driving or to experience the road's historic character, reconstruction could detract from their experience.

Community Services. None of the build alternatives would change the need for fire, medical, or other community resources in the project area. Although any of the build alternatives could temporarily increase the local population, the increased demand for county and community services would be insignificant. In the long term, future accident rates in the build alternatives are predicted to be lower than in the No Action Alternative (see *Transportation* section). Consequently, fewer services associated with accident investigation would be needed.

Attitudes Toward Growth and Development. In public meetings, community members expressed varying viewpoints about reconstruction. Some felt that a wider road would detract from the character of the Beartooth Highway, while others felt that an improved road is necessary to accommodate tourism.

Environmental Justice. EO No. 12898 addresses environmental justice in minority and low-income populations. Because no minority or low-income populations live along the road corridor, none of the build alternatives would affect such populations.

Cumulative Effects. In 2004, the FHWA will begin reconstructing U.S. 212 from YNP to the Montana/Wyoming state line near Cooke City. Construction is expected to continue for 4 years, through 2007. Construction on U.S. 212 near Cooke City and associated delays with the proposed project (Segment 4) may compound the loss of tourism between 2005 and 2007. Some users of the road may choose an alternative route or destination to avoid cumulative delays and construction activities.

Resource Commitments. None of the build alternatives would result in an irreversible commitment of resources. An irretrievable commitment of labor and public fiscal resources would be used in locating, designing, and constructing the road under the build alternatives. An additional irretrievable commitment associated with the build alternatives would be the risk to local economies of lost tourism and associated revenues due to road construction.

Proposed Mitigation

The FHWA would consider limiting nighttime construction adjacent to the campgrounds and Top of the World Store, when they are open. The decision would be made in cooperation with the SNF, based on the type of construction required by the selected alternative. Access to the Top of the World Store would be maintained at all times.

To assist local business owners and the traveling public with the delays and closures, the FHWA would develop a traffic control plan in coordination with those communities that may be most affected by the reconstruction work, such as Red Lodge. The FHWA also would develop a public information program as part of traffic management during construction. The FHWA would use various forms of communication, such as ads, signs, and brochures via radio, TV, and the Internet, to inform

road users and local business owners about the construction schedule and progress. Specific partial day or nighttime road closure times would be announced well in advance to assist motorists with trip planning.

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3.11 TRANSPORTATION

Affected Environment

Three roads provide access to the project area and would be used to transport equipment and materials to the staging areas, material sources, and work site. The roads are U.S. 212, WY 296, and WY 120. No materials would be transported through YNP, unless approved by special permit. U.S. 212 begins at the northeast entrance to YNP, and continues 13.5 km (8.4 mi.) eastward through Cooke City to the Montana/Wyoming state line. It continues 14.5 km (9 mi.) to the intersection of WY 296 and then continues eastward to Red Lodge, Montana. The start of the proposed project is about 13 km (8 mi.) east of the intersection of U.S. 212 and WY 296. U.S. 212 is designated by the USFS as the "Beartooth Scenic Byway," where it passes through the GNF, SNF, and CNF. Portions of U.S. 212 are designated as an All-American Road under FHWA's Scenic Byway Program. The designations of "All-American Road" and "Scenic Byway" are for promotional purposes and carry no restrictions to commercial use or road improvement.

The *Purpose* section of Chapter 1 discusses the current condition of U.S. 212 in the project area. Portions of the road immediately west of the project area to the intersection of WY 296 were reconstructed in the 1970s. Some spot repairs were completed in 2000. Reconstructed portions of the highway have a paved width of 9.6 m (32 ft.) and the pavement is in excellent condition. The maximum grade is 7 percent.

WY 296 joins U.S. 212 in Wyoming about 14.5 km (9 mi.) south of the Wyoming border. WY 296 is designated by the State of Wyoming as the Chief Joseph Scenic Byway. The designation of "Scenic Byway" is for promotional purposes and carries no restrictions to commercial use or road improvement. From its junction with U.S. 212, WY 296 is about 74 km (46 mi.) in length, joining WY 120 northwest of Cody, Wyoming. WY 296 was reconstructed in the 1990s. WY 296 crosses Dead Indian Pass about 8 km (5 mi.) from the intersection with WY 120. On the north side of the pass, grades average about 5 percent and numerous sharp switchbacks are present. Grades of 6 and 7 percent are present in short sections of the road.

WY 120 extends from the Montana/Wyoming state line north of Cody, Wyoming to Cody, and farther south to Thermopolis, Wyoming. The road is classified as a minor arterial from Cody to the junction with WY 296, with the exception of about 0.8 km (½ mi.) of road as it enters Cody, where it is classified as a principal arterial. Table 32 provides 2002 traffic volumes and number of trucks on area roads in Montana and Wyoming.

Environmental Consequences

Effects of the No Action Alternative

Segment 4 of U.S. 212 would not be reconstructed in the No Action Alternative. Traffic is expected to increase to 1,972 in 2025, with or without the project. The deficiencies associated with the road, such as narrow travel lanes and bridges, lack of shoulders, and poor drainage, would remain. The lack of jurisdiction would continue. A maintaining agency probably would not accept jurisdiction of the road, and the responsibility for maintenance would remain with the Department of the Interior. Congestion and delays caused by road construction on U.S. 212 would not occur. Future accident rates are predicted to be higher than in the build alternatives. Operating speeds probably would remain the same or decrease if the road surface deteriorates.

Effects of the Build Alternatives

Long-term Road Improvements. The deficiencies identified in Chapter 1 would be corrected by all build alternatives. The reconstructed road surface would have a design life of 20 years, and structural elements, such as retaining walls and bridges, would have a design life of 75 years. The drainage problems, which cause many of the pavement problems, would be corrected. The reconstructed road would accommodate projected traffic volumes operationally in 2025.

Long-term Jurisdiction and Maintenance. The proposed project needs to provide a reasonably maintainable transportation facility with design features compatible with current maintenance equipment and techniques that would allow safe and efficient maintenance of the roadway by a maintaining agency. All build alternatives would achieve this need. Alternative 4 would have design features that would be most easily maintained. Alternatives 3 and 5, which have a narrower roadway width, would be more difficult to maintain than the other build alternatives. All build alternatives would have substantially lower maintenance costs than a similarly maintained road in the No Action Alternative.

The Wyoming Transportation Commission may consider assuming ownership maintenance responsibility for the Wyoming portion of the road when the entire section within Wyoming is reconstructed to current standards. If the State of Wyoming does not agree to accept ownership and maintenance responsibility after reconstruction, maintenance responsibilities will remain with the Department of the Interior. The build alternatives would improve the likelihood of the Wyoming Transportation Commission accepting ownership and maintenance responsibility of the Wyoming section of the road.

Table 32. Current traffic volumes on area roads.

Road	Year	Average Annual Daily Traffic (vehicles/day)	# of Trucks/day
U.S. 212	2002	460	10
WY 296	2002	405	45
WY 120	2002	1590	190

Source: WYDOT 2003.

Long-term Changes in Operating Speeds and Accident Rates. In all build alternatives, the reconstructed road would be wider, smoother, and have a more consistent horizontal and vertical alignment than the existing road. As a result, drivers may feel safer and therefore drive faster. However, on about 50 percent of the project, the tendency of the motorist to drive faster would be offset by the geometry of the road. For example, in the switchback areas, the operating speeds probably would not change because the new curves would have almost identical radii as the existing curves, and would have very similar design and operating speeds.

Locations where operating speeds would be more likely to increase would be where the existing road is relatively straight and has good sight distance. The largest increase in operating speeds probably would occur in the Top of the World Store area in Alternatives 3 and 4. These alternatives have the alignment option that would follow the existing roadway, where current operating speeds are the highest. Alternatives 5 and 6 would use Option A at the Top of the World Store area, and would have the slowest operating speeds, due to the curvilinear design of the road. (Design speeds are discussed in Chapter 2 and Appendix C.) Alternative 4 has the alignment options with the highest design speeds. Consequently, operating speeds in Alternative 4 probably would be higher than operating speeds for the other build alternatives. For all build alternatives, the average operating speeds would increase by about 8 km/h (5 mph).

The FHWA completed an accident prediction analysis to compare the expected safety performance of the build alternatives. Projected accident rates in 2025 for all build alternatives would be 39 to 49 percent less than the future No Action Alternative (Table 33). The analysis also included each of the six realignment areas discussed in Chapter 2. The projected accident rates for the realignment areas are presented in the Traffic Accident Study (Washington Infrastructure Services, Inc. 2002).

Short-term Congestion and Delays. In all build alternatives, road construction would increase congestion and traffic delays when the road is open during the 6-year construction period. Congestion and delays would cease when construction is completed.

During construction, increased truck and automotive traffic would occur on roads used for access to the project area (U.S. 212, WY 296, and WY 120). During certain construction operations, truck traffic could increase to 150 to 200 truck trips per day. On the steeper portions of U.S. 212 and WY 296, the additional truck traffic would reduce free-flow operation at times.

The Fox Creek Campground would be used as a workcamp during the 6-year construction period. Vehicular traffic would increase between the workcamp and the project area. Increased construction traffic would cease when construction is completed.

Closures and delays would be similar to those needed for the North Fork Road construction project (U.S. 12/14/20 from Cody to YNP). During peak tourist season (July 15 through August 15) and peak traffic times, the road would remain open during the day with ½-hour maximum delays. During off-peak times, the road would remain open with 1-hour maximum delays at selected intervals, depending on the construction operation requirements during the delay. Longer delays or partial day closures may be needed for certain operations, such as rock blasting and bridge construction, and a special schedule would be developed for these instances. The road may be closed at night during the entire construction season.

Segment 4 opens by Memorial Day and closes by Columbus Day (about October 15). The road sometimes is accessible by car up to the road closure gate east of Long Lake before Memorial Day, depending on snow conditions. To facilitate early season construction before Memorial Day, the FHWA may move the road closure gate to the western end of the project near Clay Butte Lookout turnoff. The road east of the Clay Butte Lookout turnoff may be closed before Memorial Day to complete the complex construction operations in the Beartooth Ravine area.

Cumulative Effects. In 2004, the FHWA will begin reconstructing U.S. 212 from YNP to the Montana/Wyoming state line near Cooke City. Construction is expected to continue through 2007,

Table 33. Predicted accident rates in 2025 for all alternatives.

Alternative	Predicted Accident Rate[†]	Change from No Action
1-No Action	2.41	0
2-Recreation and Cultural Resources	1.41	-41%
3-Wildlife Resources	1.47	-39%
4-Highway Operations, Safety, and Maintenance	1.22	-49%
5-Biological Resources	1.39	-42%
6-Blended Emphasis	1.36	-43%

[†]Accident rate is annual equivalent accidents per million vehicle miles.
Source: Washington Infrastructure Services, Inc. 2002.

possibly overlapping the proposed construction for the road segment analyzed in this EIS by 3 years. The two projects would result in cumulative delays between Red Lodge and YNP between 2005 and 2007. Travel times between Red Lodge and YNP between 2005 and 2007 may increase by 1 to 2 hours. Heavy equipment traffic associated with the New World Mine District cleanup also may cause some delays, primarily on U.S. 212 between WY 296 and near Colter Pass.

Resource Commitments. None of the build alternatives would result in an irreversible or irretrievable commitment of resources.

Proposed Mitigation

No specific mitigation is proposed. The mitigation discussed in the *Socioeconomics* section concerning traffic control and delays is applicable.

References

Washington Infrastructure Services, Inc. 2002. Traffic Accident Study–United States Highway 212, Beartooth Highway. Prepared for the Federal Highway Administration-Central Federal Lands Highway Division, Lakewood, CO.

Wyoming Department of Transportation. 2003. Sherm Wiseman, Personal comm. with Richard Trenholme, ERO Resources Corp., August 7.

3.12 Water and Aquatic Resources

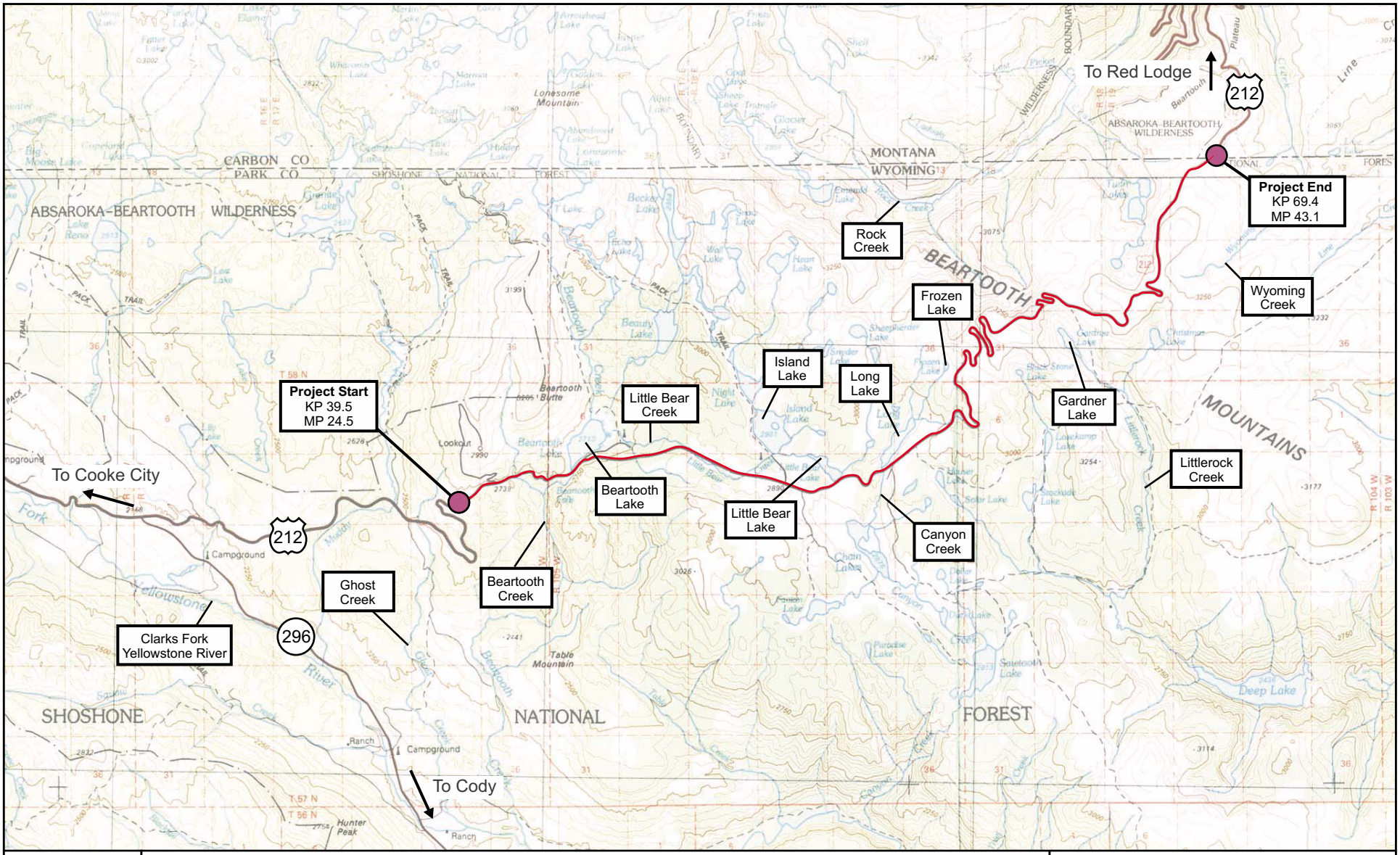
Affected Environment

Four creeks drain the project area (Figure 43). Beartooth Creek, and its tributary, Little Bear Creek, drain the area from the west end of the project area to Long Lake. Canyon Creek drains from Long Lake to west of the West Summit. Littlerock Creek drains the area south of the road between East Summit and West Summit. Rock Creek, which flows north into Montana, drains the area north of the road and east of the West Summit. All creeks are in the watershed of the Clarks Fork Yellowstone River. The Clarks Fork Yellowstone River enters Wyoming west of the project area and exits Wyoming into Montana east of the project area. A portion of the Clarks Fork Yellowstone River, about 10 km (6 mi.) south of the project area, is designated a Wild and Scenic River.

Perennial streams crossed by the road in the project area include Beartooth Creek (crossed twice), Little Bear Creek (crossed three times), Canyon Creek, and an unnamed tributary to Long Lake. Numerous ephemeral streams caused by snowmelt form along or cross the road in late spring and early summer. The road closely follows Little Bear Creek between Beartooth Lake and Island Lake.

The streams in the project area are generally perennial and most of the flow is from snowmelt runoff. Some streams are perennial, with flows maintained by seeps or springs. Annual streamflows are dominated by a single snowmelt peak during late spring/early summer, with low variability in daily mean discharge throughout the year. Variability in annual flows in the project area streams is generally small (Zelt et al. 1999). Streams are characterized by turbulent flows, steep gradients, cold water temperatures, coarse substrates and clear, well oxygenated water.

Along the road are numerous lakes that formed in depressions created by glacial activity. Surface water is readily stored due to the low porosity of the soil, shallow depth to bedrock, and large expanses of outcropping granitic bedrock. Lakes next to the road include Beartooth Lake and Long Lake, which drain to the south under the road. Many other lakes are located 0.3 km (0.5 mi.) or less from the road. No streamflow gages or lake level gages are in the project area.



ERO

ERO Resources Corp.
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Denver, CO 80218
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Fax: 830-1199

- Project Start and End
- Creek
- Lake

1/2 Inch = 1 Mile

N

Figure 43
Surface Water Resources

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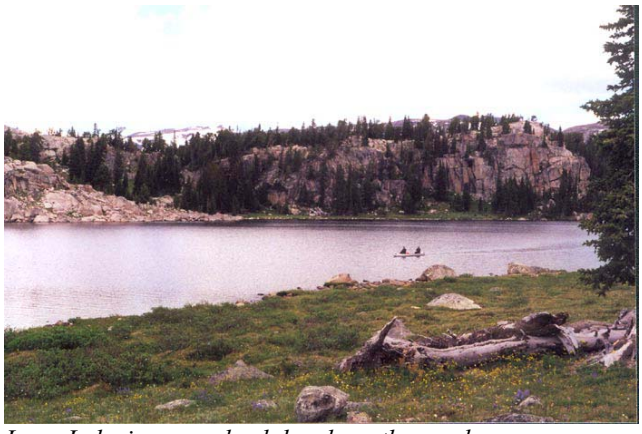
Surface Water Quality and Use

Suspended sediment and dissolved solids concentrations are low in streams within the project area. Overland flow and channel scour, which occur during peak runoff events such as snowmelt, are the primary sources of suspended sediments. Dissolved solids concentrations are greater during periods of low flow.

All project area lakes and streams are classified as Class 2AB waters. Class 2AB waters are defined as having high quality and are protected for all uses, including agriculture, fisheries and other aquatic life, industry, scenic value and wildlife, drinking water, and recreation (WDEQ 2001). Surface water quality in the project area is generally very high. The water is cold, clear, and highly oxygenated. Water quality data have not been collected for any lakes or streams within the project area. Surface water quality changes in area streams as a result of road runoff during periods of snowmelt or large rainfall events, human recreational activities, and livestock grazing near streams. In addition, scouring of Little Bear Creek occurs west of the Top of the World Store at the bridge because the bridge is undersized. Water is used in the project area at campgrounds and the Top of the World Store. The store is supplied from a spring and the campgrounds from wells or spring boxes. No stock ponds and no surface water diversions are in the project area. For waters designated Class 2AB by WDEQ, beneficial uses of the streams and lakes within or directly downstream of the project area include fisheries and other aquatic life, drinking water, recreation, scenic value, and wildlife and fish consumption. Another downstream use outside of the National Forest is agricultural water use.



Long Lake is a popular lake along the road.

Floodplains

Within the project area, the road crosses four narrow floodplains—at the outlets of Beartooth Lake and Long Lake, and where the road crosses Little Bear Creek east and west of the Top of the World Store. Other than these crossings, the road is not located within a floodplain. Snowmelt runoff, which occurs over a 4- to 6-week period in June and July, causes water to flow over the road at some locations.

Fisheries and Aquatic Resources

The Wyoming Game and Fish Department classifies the major streams in the project area as Class 3, which are important trout waters with regional significance. The primary management species in the streams is wild brook trout (Wyoming Game and Fish Department 2001).

The aquatic biological community is "salmonid"—trout, including whitefish, trout, salmon, chars, and graylings. Historically, most of the area lakes were barren of fish due to being isolated by downstream falls. For example, Beartooth Falls is a barrier to fish passage on Beartooth Creek. The Wyoming Game and Fish Department stocks many of the lakes that have suitable fish habitat. Species present in Beartooth Lake are brook trout, rainbow trout, lake trout, arctic grayling, Yellowstone cutthroat trout, white sucker and lake chub. Little Bear Lake contains brook trout and lake chub, and

Long Lake contains brook trout, rainbow trout, lake trout, Yellowstone cutthroat trout, and lake chub. Little Bear Creek, Little Rock Creek, and Beartooth Creek contain brook trout. Fish in the area lakes and streams are generally small due to the short growing season (SNF 2001b).

The Wyoming Game and Fish Department has introduced arctic grayling into Beartooth Lake. The adfluvial grayling, or lake dwelling fish, is a distinct population different from the fluvial (river) grayling, designated as a candidate species for federal threatened or endangered species status. The Yellowstone cutthroat trout is designated a Forest Service sensitive species.

Little aquatic vegetation is found in project area streams. Some species of algae, such as diatoms, red algae, and river mosses, are found in particular stream habitats. Invertebrate fauna include mayflies, caddisflies, true flies, stoneflies, and riffle beetles.

Environmental Consequences

Effects of the No Action Alternative

In the No Action Alternative, the road would not be reconstructed. As a result, bridges and culverts may fail and some sections of the roadway would continue to be poorly drained. Poor road drainage and other weathering would cause the road to deteriorate in some locations, and increased transport of road materials to streams and lakes and disturbances of aquatic habitats may occur.

For all alternatives, including the No Action Alternative, the numbers of visitors to this area likely would increase in the future, thus increasing potential impacts on lakes and streams from increased fishing and shoreline degradation.

Effects of the Build Alternatives

Surface Water Quality and Use. Potential impacts on water and aquatic resources would include disturbance during road construction, particularly during the removal and replacement of culverts and bridges at stream crossings. Road and bridge construction would increase sediment transport into streams and lakes. Authorization from WDEQ for a short-term increase in the turbidity limit of 10 NTUs (an optical measurement) for surface waters affected by construction would be needed during construction. Atmospheric deposition of particulates into streams and lakes may increase due to dust from heavy equipment and vehicles during construction. Expected sediment increases would not result in significant water quality degradation or loss of beneficial uses. BMPs would minimize sedimentation and turbidity. Turbidity would be monitored during construction. Construction-related runoff and turbidity would decrease when construction is completed and revegetation becomes established.

In all build alternatives, a small part (616 m^2 [0.15 ac.]) of Long Lake would be filled adjacent to the new bridge. A retaining wall on the bridge's northwest corner would be used to minimize the fill. Fill would be used at the northeast corner to provide a more aesthetic appearance, similar to the existing shoreline. Other small ponds would be filled in all build alternatives.

Two material sources sites are being considered for the road construction, and would be used if an adequate volume of material is not available from rock cuts. The Ghost Creek site would be the primary material source. The area would be excavated to the grade of the existing road next to it. No excavation would occur below the water table and the area would be revegetated after completion of road construction. The Island Lake

moraine area would be excavated to the grade of the area adjacent to it; no excavation would occur below the water table. The area would be revegetated after completion of road construction. At both locations, excavation in or near stream channels (Ghost Creek or Little Bear Creek) would be avoided and BMPs would be used to minimize erosion and sedimentation of nearby surface water bodies and wetlands.

In the long term, the project would be beneficial for surface water quality in and near the road. For example, scouring of Little Bear Creek west of the Top of the World Store would be reduced significantly because the new bridge would be larger and better aligned with the creek. Also, pullouts and parking areas would be paved, reducing sediment in runoff.

The only planned road realignments that may affect surface water quality would be the realignments at the Top of the World Store area in Alternatives 2, 5, and 6. The purpose of the realignments is to move the road away from Little Bear Creek. Where the road would no longer be adjacent to the creek, the realignments would provide a greater buffer for drainage from the road into the creek. This would be a long-term beneficial effect on Little Bear Creek.

In cutslope areas with steep road grades (greater than 5 percent), paved ditches would be constructed to improve drainage from the road. The improved ditches would allow greater control of road runoff and decrease ditch erosion presently occurring. Where runoff is diverted off the road, the flow would be dissipated with rock riprap to minimize erosion and scouring.

None of the build alternatives would affect existing water uses in the project area. Stream flows may be rerouted temporarily during various stages of road construction, particularly at bridge crossings. Any placement of fill in a stream would require a 404 permit from the U.S. Army Corps of Engineers. A 401 certification from the State of Wyoming is required prior to issuance of a 404 permit. Small withdrawals of water for roadwork, such as for dust suppression, would not adversely affect local streamflows or lake levels. Water withdrawals would require approval from the Wyoming State Engineer's Office.

Floodplains. Bridges would be built across four floodplains. Except for the Little Bear Creek bridge #1 in Alternative 2, all of the bridges would span the creeks. Bridges would be sized to provide adequate protection against the 100-year flood event and to minimize riparian impacts. (Beartooth Ravine bridge would not span a creek.) In Alternative 2, the new Little Bear Creek bridge #1 would require construction of a pier on an island in the middle of the creek. A coffer dam probably would not be used during construction, but drilled shafts or other temporary structures may be needed during placement of the pier's substructure. Some temporary rerouting of the creek may be required.

At Beartooth Lake and Long Lake, larger bridges would be built, which would reduce potential flooding problems. For all build alternatives, the bridge abutments at all bridges except Long Lake would be built out of the floodplains. Riprap would be placed in the streams at all locations except Long Lake. A retaining wall at the northeast corner of the new bridge would be needed in Long Lake, partially filling the lake. Riprap may not be needed at the Long Lake bridge. For Little Bear Creek bridge #1 in Alternatives 3 and 4, retaining walls would also be placed in the stream at the northwest and southeast corners of the bridge. In addition, in Alternatives 3 and 4, riprap may be placed in the creek where the road would remain close to the creek, as part of retaining wall construction. It is not possible to avoid the road

crossing the floodplain of Little Bear Creek. Because the new bridges at Little Bear Creek would be larger for all build alternatives, potential flooding problems would be reduced. None of the build alternatives would adversely floodplains.

Fisheries and Aquatic Resources. During construction, aquatic habitat would be disturbed where existing bridges would be removed and new bridges built. Existing culverts would be replaced and new culverts would be installed where necessary. Populations of algae, invertebrates and fish may be temporarily reduced or eliminated within and near construction areas and material sources sites. After construction, fisheries and other aquatic populations would return to pre-construction conditions.

Cumulative Effects. Other foreseeable activities in the area include the widening of 13.5 km (8.4 mi) of U.S. 212 between the northeast entrance to YNP and the Montana/Wyoming state line near Cooke City. The eastern portion of the project would be in the upper watershed of the Clarks Fork Yellowstone River. BMPs would be used to minimize surface runoff and increased sedimentation. Cleanup of the New World Mining District would improve water quality and aquatic habitat in the upper Clarks Fork Yellowstone River.

Other projects planned by the SNF, such as gravel surfacing of the Clay Butte Lookout access road, may result in a short-term increase in erosion and surface runoff. The SNF would use BMPs to minimize surface runoff. The reasonably foreseeable future activities are not expected to have adverse cumulative effects with the proposed project.

Resource Commitments. The build alternatives would not result in an irreversible commitment of resources. The filling of 616 m^2 (0.15 ac.) of Long Lake as well as other small ponds would be an irretrievable commitment of resources in all build alternatives.

Proposed Mitigation

The FHWA would use BMPs to minimize soil erosion and adverse effects on surface water quality. Construction requirements described in FHWA's Standard Specifications for Road and Bridge Construction would be used to minimize erosion and sedimentation during and after construction (FHWA 1996). The WDEQ's BMPs designed to reduce or eliminate water quality degradation due to physical modifications of surface water would be used for this project (WDEQ 1999).

The FHWA would apply for a Section 404 permit to place fill material into surface waters. Impacts at Long Lake would be mitigated as required by the 404 permit. The USFWS, SNF, Wyoming Game and Fish Department, and the public would be provided an opportunity to review and comment on the 404 permit application. The 404 permit would require a Water Quality (401) Certification from the WDEQ before a 404 permit can be issued. To obtain a 401 certification, all discharges into surface water must not result in an expected violation of any applicable water quality standard.

The FHWA would seek authorization from the WDEQ to discharge storm water associated with construction activities under the National Pollutant Discharge Elimination System (NPDES). The NPDES permit requires a Stormwater Pollution Prevention Plan for the construction activities to minimize impacts on surface waters. The plan would be monitored during and after construction until all disturbed areas are stabilized. FHWA would be responsible for compliance with the NPDES permit, and may turn over monitoring duties to the SNF or the NPS.

The contractor would obtain all permits and approvals for use of water for construction purposes.

References

Federal Highway Administration. 1996. Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects. FP-96.

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Zelt, Ronald B., G. Boughton, K.A. Miller, J.P. Mason and L.M. Gianakos. 1999. Environmental Setting of the Yellowstone River Basin, Montana, North Dakota and Wyoming. Water-Resources Investigations Report 98-4269. U.S. Geological Survey, Cheyenne, WY.

3.13 Air Quality and Visibility

Affected Environment

The Prevention of Significant Deterioration (PSD) program under the Clean Air Act is designed to preserve and protect air quality in National Parks (such as Yellowstone) and wilderness areas (such as the Absaroka-Beartooth Wilderness). Under the PSD provisions, three classes of lands were established. Class I allows very little deterioration of air quality; Class II allows moderate deterioration. The amount of allowable deterioration varies with each air pollutant. A Class III designation, which has not been assigned to any area in the SNF, indicates areas where substantial industrial or other growth is allowed and where increases in concentrations up to the national standards would be insignificant.

The SNF, through which the Beartooth Highway passes, is classified as a PSD Class II area. The adjacent Absaroka-Beartooth Wilderness, which was established in 1978, is also a Class II area because any wilderness created after the Clean Air Act amendments of 1977 is a Class II area. The closest Class I PSD area to the project area is the North Absaroka Wilderness in the SNF, located about 8 km (5 mi.) southwest of the western end of the project area. YNP, also a Class I PSD area, is located about 24 km (15 mi.) west of the western end of the project area. The project area is not in an EPA-designated non-attainment area, and an implementation plan to comply with air quality standards is not necessary. The proposed project is in the Wyoming State Transportation Improvement Program.

Existing Air Quality

Because the project area is in a non-industrial, rural area, existing air quality and visibility in the project area is excellent. The air quality in the project area does not exceed National Ambient Air Quality Standards. Background particulate and carbon monoxide levels in the project area are very low (Greater Yellowstone Area Clean Air Partnership 1999). Vehicles (both automobile and snowmobile) are the primary existing sources of emissions in the project area. Particulate concentrations are higher near unpaved roads, such as the road to the Clay Butte Lookout. When wildfires

are west of the project area, particulate levels are elevated for short periods.

Prevailing wind direction is from the southwest, although individual storm fronts can have prevailing north or south wind directions. Up-valley and down-valley wind patterns develop during summer. Wind dispersion throughout the project area is excellent.

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not affect existing air quality. Over the long term, increased traffic would increase emissions of gaseous pollutants, primarily petroleum hydrocarbons and carbon monoxide. The increased pollutants would not exceed applicable air quality standards.

Effects of the Build Alternatives

The build alternatives would have similar effects on air quality. In the short term, truck and equipment traffic and activity would increase dispersed dust and mobile exhaust emissions. At the material sources sites, dust would be generated during materials blasting, excavating, and loading into trucks. Increased dust would be visible from the road and would last as long as material is being generated. At staging areas such as Ghost Creek, hot mix plants would be used to make asphalt and would generate hydrocarbon emissions. The plume would be visible from the road and other locations near the staging areas. The increased dust and emissions would occur over the 6-year construction period and would cease after construction is completed. Over the long term, increased traffic levels would increase emissions of gaseous pollutants, primarily petroleum hydrocarbons and carbon monoxide. The increased pollutants would not result in exceedances of applicable air quality standards.

Cumulative Effects. The build alternatives would not result in cumulative effects with any reasonably foreseeable activity.

Resource Commitments. None of the build alternatives would require an irreversible or irretrievable commitment of resources.

Proposed Mitigation

All construction activities would be conducted in compliance with WDEQ requirements for construction-related fugitive dust. Dust abatement measures, such as watering unpaved disturbed areas, would be implemented. Disturbed areas would be revegetated as soon as possible after construction of a given road section is completed.

References

Greater Yellowstone Area Clean Air Partnership. 1999. Greater Yellowstone Area Air Quality Assessment Document. March.

3.14 Soils, Geology, and Paleontology

Affected Environment

Geology and Paleontology

The Beartooth Highway is located in the southeast portion of an area known as the Beartooth uplift (Woodward Clyde Inc. 1998). The Beartooth uplift consists of granite and metamorphic rock overlain in places by sedimentary rock. Glaciation and erosional processes are responsible for the majority of the landscape forms currently present. Surface geology along most of the road is granites and granitic gneisses (Pierce 1965; Pierce and Nelson

1971). Other surficial geologic units along the road consist of glacial till from the Beartooth Ravine to Long Lake, a large landslide west of the Clay Butte Lookout turnoff, and sedimentary rock near the Top of the World Store. The landslide, about 1.6 km (1 mi.) long, extends along the western face of Clay Butte (Pierce and Nelson 1971).

The Beartooth Plateau offers the opportunity to view the effects of frost action and soils, rock and vegetation. A geologic feature called patterned ground is scattered throughout the alpine portion of the road. Patterned ground is the symmetrical well-defined forms, such as polygons, circles, strips and nets, that are the result of frost heaving of subsurface rock (James 1995). An excellent example of patterned ground is found inside the West Summit circular pullout. Because patterned ground occurs principally in polar, subpolar and arctic regions, its proximity to the road provides travelers a unique opportunity to see these forms. These features also provide study opportunities for students. Other unusual geologic and vegetation features found in the alpine region include frost hummocks, frost boils, and alpine bogs.

Two normal faults cross the road, one west of Top of the World Store near Little Bear Creek bridge #1, and one about 0.8 km (½ mi) east of the entrance to the Beartooth Campground (Pierce and Nelson 1971). The only exposures of sedimentary rock along the road are near the Top of the World Store fault. The Gros Ventre Formation consists of micaceous shale and limestone. The Flathead Sandstone is found near Little Bear Creek bridge #2.

The granitic rocks that comprise most of the surface geology have no potential for fossils (Beasley undated). Invertebrate fossils are known to occur in the Park Shale and Flathead Sandstone. No paleontologic resources were identified in the project area.

Soils

Soils in the project area are the result of the slow weathering of granitic rock, except where sedimentary material is present. The SNF has identified broad soil types present along the road. General soil characteristics for the four main vegetation communities in the project area—alpine meadow, subalpine forest, montane meadow, and montane forest—are discussed below (SNF unpublished, ERO Resources Corp. 2001d).

Soils in the alpine portions of the project area typically have a 5- to 25-cm (2- to 10-in.) thick surface horizon of loam or sandy loam material. Rock fragments are common on the soil surface and are generally greater than 50 percent of the soil volume at depths over 25 cm (10 in.). Organic matter is high, and soil pH and fertility are low. Areas of rock outcrop with limited soil development are scattered throughout the alpine zone.

The subalpine portion of the project area from near Little Bear Lake to Frozen Lake includes large expanses of rock outcrop or talus intermixed with pockets of soil. Over 50 percent of the soil surface

Beartooth Butte is remnant of sedimentary rocks that once covered the Plateau.

is stones, boulders, and cobbles. Soil types are similar to the alpine soil units and typically include sandy loam surface textures with topsoil depths of 5 to 23 cm (2 to 9 in.). Organic matter is high, and soil pH and fertility are low.

Soils in the montane and wetland meadows between the Top of the World Store and Little Bear Lake include upland and wetland soils. Dry upland meadows typically have a sandy loam or loam surface horizon from 20 to 30 cm (8 to 12 in.) thick. Wetland soils are present along streams, drainages, and seeps and are somewhat poorly drained. Most wetland soils have a surface horizon of organic material and, in some locations, fens are present when the organic horizon is over 20 cm (8 in.) thick. Wetland soils include sandy loams, loams, and silt loams with topsoil depths from 30 to 61 cm (12 to 24 in.).

An additional upland montane meadow soil unit is found west of the Clay Butte Lookout turnoff. These soils have formed in sedimentary parent material and include sandy loam to silt loam textures in the surface horizon at depths of 8 to 23 cm (3 to 9 in.). Subsoils contain over 40 percent gravels and cobbles. These soils have slightly higher fertility and are less acidic than other soils in the project area.

Forest soils west of the Top of the World Store are well drained gravelly loams with a surface horizon from 5 to 25 cm (2 to 10 in.) thick. Rock fragments are more than 50 percent of the soil profile below the surface horizon. Soil organic matter is high, and soil pH and fertility are low. Granitic rock outcrops with limited soil development are common immediately west of Beartooth Lake.

The revegetation potential of soils in the project area is limited by low fertility and the low water holding capacity of the coarse-textured soils. The erosion potential for most soils in the project area

Wet alpine soils form hummocks from frost heaving.

is low to moderate; the potential for erosion increases with the steepness of the slope. The high percentage of rock in the soil helps to armor the soil and reduce erodibility, but increases the difficulty in topsoil salvage and reapplication.

No farmlands are in the project area. Farmlands are discussed on page 217.

Environmental Consequences

Effects of the No Action Alternative

The No Action Alternative would not affect soil, geologic, or paleontological resources. Soil resources would not be disturbed. Existing areas of bare soil from previous construction activities or borrow areas would not be reclaimed.

Effects of the Build Alternatives

Geology and Paleontology. All build alternatives would require rock blasting in some locations. Larger cuts and fills would be created in each build alternative. These activities would alter the area's topography. A large fill would be needed to provide stability to cross the landslide near the Clay Butte Lookout turnoff.

Most of the new construction would occur in areas underlain by granitic rocks with no potential for fossils. Invertebrate fossils have been found in the

Gros Venture Formation and Flathead Sandstone. The significance of these fossils is low, and the presence of these geological units does not warrant any mitigation measures (Bright 2001).

Soils. Disturbance to soil resources from excavation, grading, and construction activities would be similar for all build alternatives. Alternative 2 would disturb about 78 ha (194 ac.) of soil resources and Alternative 3 would disturb about 71 ha (176 ac.) of soil resources (Table 34). The disturbance area for other alternatives would fall within this range. About 4 ha (10 ac.) of disturbance for all build alternatives would occur to areas of rock outcrop or talus slopes with minimal to no soil cover. Topsoil from material sources and staging areas would be salvaged and used during reclamation.

Some loss of soil material from wind and water erosion would be likely during construction and until disturbed areas can be revegetated. BMPs would be implemented to minimize soil loss. A short-term loss in soil productivity would occur from disruption of soil biological processes and changes in the soil physical properties from construction disturbance. Topsoil salvage, replacement, and revegetation would minimize the long-term effect on soil productivity and the loss of soil material.

Areas requiring reclamation would include cut and fill slopes and abandoned road sections. The area of reclamation necessary would range from 66 ha (164 ac.) for Alternative 3 to 70 ha (174 ac.) for Alternative 2 (Table 34). Available topsoil for stripping and reclamation would average about 11 cm (4 in.) and varies less than 5 percent between build alternatives (ERO Resources Corp. 2001d). Topsoil, however, is not evenly distributed throughout the project corridor and would range from about 0.8 cm (< ½ in.) per kilometer (0.6 mi) in the rocky subalpine portion of the road to 22 cm (9 in.) in deeper montane meadows at lower elevations.

Topsoil would be replaced on disturbed areas to a minimum depth of 5 cm (2 in.) following construction. Abandoned road sections would be reclaimed using either topsoil from nearby disturbed lands, imported soil, or organic amendments. Additional redistribution of topsoil to soil deficient sites may be necessary to aid revegetation.

Cumulative Effects. Highway construction projects on U.S. 212 and in YNP have resulted or would result in similar site disturbances and impacts on soil resources adjacent to existing roads. The impact on soil resources from the proposed project and other regional highway projects would be localized and would not result in cumulative impacts on soil resources. Anticipated future growth in tourism and recreation along the road corridor may increase soil compaction and erosion near popular trails and recreation sites. The cumulative impact of recreation-related soil

Table 34. Area of soil disturbance and reclamation.

	Alternative											
	1		2		3		4		5		6	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Total Soil Disturbance	0	0	78	194	71	176	74	183	73	180	76	187
Reclamation Area	0	0	70	174	66	164	69	171	68	170	69	172

disturbance with impacts on soils from build alternatives would not be adverse. Reasonably foreseeable future activities and the proposed project would not have cumulative effects on geologic or paleontological resources.

Resource Commitments. All build alternatives would result in an irreversible commitment of resources. Topsoil would be removed before construction for use in revegetation of disturbed areas, but some irreversible soil loss due to erosion would occur. The productivity of disturbed sites over the long term would be less than original undisturbed conditions, which would be an irreversible commitment of resources. All build alternatives would irreversibly alter the area's topography with rock blasting and larger cuts and fills. Loss of soil productivity due to pavement would be an irretrievable commitment of resources.

Proposed Mitigation

Mitigation measures to protect and preserve soil resources in the project area would be incorporated in the landscaping and revegetation plan and are incorporated into FHWA's and WDEQ's BMPs. Components of these plans include the implementation of measures to minimize the loss of soil material before, during, and after construction. General erosion control measures would include minimizing the area of disturbance to defined construction limits and limiting the time bare soil is exposed. Suitable temporary sediment control measures such as silt fences, sediment logs, trenches, and sediment traps would be used to contain soils within the project area.

No earthwork operations would be allowed until after the removal of topsoil. Woody vegetation would be removed prior to topsoil salvage. Topsoil within tree stump roots would be salvaged to the extent possible. Topsoil salvage methods include windrowing topsoil at the limits of construction and pulling the soil back on slopes during reclamation. Selective topsoil redistribution to soil deficient areas would be used as needed. Soil amendments, mulches, and seeding would be selectively applied to match site conditions and revegetation goals. Long-term soil protection would come from prompt revegetation of disturbed areas following construction.

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3.15 Noise

Any road construction project has the potential to produce both short-term and long-term noise impacts. Short-term impacts are produced by activities associated with the construction of the project. Construction equipment, blasting, and the workcamp all have the potential of creating short-term noise impacts in the project area. Long-term noise impacts result from the projected traffic increases resulting from the road improvements.

Affected Environment

Noise is measured in decibels (dB) scaled to approximate the hearing capability of the human ear (dBA). Environmental or background noise is described in terms of the energy equivalent noise level over a 1-hour period. This measure accounts for the moment-to-moment fluctuations in A-weighted sound levels due to all sound sources during that hour, combined (USDOT 1995).

The road extends through uninhabited forested and meadow areas. The existing noise sources include traffic from the road as well as all other sources of noise including campers, hikers, generators, wind, birds, and streams. The FHWA measured existing noise levels in key recreational areas along the road. Daytime noise levels ranged from about 48 dB at the Beartooth Campground and Top of the World Store to 35 dB at the Island Lake Campground. Noise levels in the wilderness and roadless areas range from about 40 dB in locations near the road to 20 dB inside the area, away from the road.

The FHWA has developed noise abatement criteria for traffic noise for use on projects throughout the nation, using state Department of Transportation abatement methods as a guide (Table 35). The FHWA considers noise abatement if predicted future traffic noise levels approach or exceed the noise abatement criterion, or if future traffic noise levels are substantially higher (10 to 15 dB) than existing levels.

Because they are recreation areas, the campgrounds in the project area and the Top of the World Store are considered category B activities. The wilderness, roadless, and the wilderness study areas in the project area are managed for their serenity and quiet and considered category A activities (Table 35).

Environmental Consequences

Effects of the No Action Alternative

Estimated noise levels associated with current traffic volumes range from 35 to 51 dBA (Table 36). Future traffic in 2025 is expected to more than

Table 35. FHWA noise abatement criteria.

Activity Category	Noise Level	Description of Activity Category
A	57 dBA (exterior)	Lands on which serenity and quiet are of extraordinary significance and that serve an important public need and where the preservation of those qualities is essential if the lands are to continue to serve their intended purpose
B	67 dBA (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals
C	72 dBA (exterior)	Developed lands, properties or activities not included in Categories A or B above
D	—	Undeveloped lands
E	52 dBA (interior)	Residences, motels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Source: 23 CFR 772.5, Table 1.

Table 36. Existing and predicted future noise levels associated with increased traffic.

Sensitive Receptor	Existing Distance		Estimated Existing Traffic Noise†	Projected Traffic Noise Level for Each Alternative					
	(m)	(ft.)		1	2	3	4	5	6
Beartooth Lake Campground	161	528	41	45	45	45	45	45	45
Top of the World Store	60	196	51	55	52	55	55	56	56
Island Lake Campground	274	898	35	38	41	38	38	41	41
Absaroka-Beartooth Wilderness	322	1,056	39	42	42	42	42	42	42
High Lakes Wilderness Study Area	91	300	41	45	45	45	45	45	45
South Beartooth Highway Roadless Area	76	250	42	46	46	46	46	46	46
Line Creek Roadless Area	610	2,000	35	38	38	38	38	38	38

All noise levels are dBA.

†Note that the estimated existing traffic noise levels differ from the existing ambient noise levels presented in Table 37. The existing noise levels presented in this table are estimates involving assumptions for traffic numbers and speed; the measurements presented in Table 37 include noise sources other than traffic.

Source: FHWA 2001

double to 1,972 vehicles per day for the No Action Alternative. Noise associated with increased traffic is predicted to increase 3 to 4 dBA, depending on the location (Table 36). No construction noise would be generated under the No Action Alternative.

Effects of the Build Alternatives

Construction Noise. All build alternatives would have similar noise effects during construction. During construction, noise would be generated along the road by heavy equipment, blasting, and worker vehicles. The noise would be loudest near the point of generation and would decrease with increasing distance from the source. During a construction season, noise would be generated where construction occurs, typically a road section 1 to 3 km (1 to 2 mi.) long. Noise also would be generated during construction of the workcamp and at the staging areas and material sources.

Existing and predicted construction noise levels at locations along the road are presented in Table 37. Campground users would be most affected by the increased noise. Construction noise is predicted to be generally to very audible at the Beartooth Campground and very audible at the Island Lake Campground. Noise from general construction would be occasionally audible in the wilderness and roadless areas as far as 4 km (2.5 mi.) away. Frequently, many of the complaints of construction noise involve standard backup alarms, which are used on heavy equipment as a safety device. Backup alarms would be audible up to 3.2 km (2 mi.) from their source. At the Top-of-the World Store, Little Bear Creek bridge #1 construction would be increase noise levels. After bridge construction is completed, construction noise levels are expected to be less than those shown in Table 37. After the 6-year construction period, construction noise would cease.

Future Traffic Noise. Noise levels associated only with current and future traffic would be the same for all build alternatives. Future traffic in 2025 is expected to more than double to 1,972

Table 37. Existing noise levels and predicted construction noise levels.

Location	Existing Noise Levels		Predicted Construction Noise Level	
	Daytime (dBA)	Nighttime (dBA)	From All Sources (dBA)	From All Sources Except Nearby Road Construction (dBA)
Beartooth Lake Campground	48	48	56	51
Island Lake Campground	35	32	61	59
Top of the World Store	47	44	85	84
Clay Butte Lookout Tower	43	34	56	46
Morrison Jeep Trail	35	32	66	37
Sawtooth Lake Trail	43	39	72	59
West Summit	47	NM	58	40
Pilot-Index Overlook	40	NM	Not applicable	41

NM = Not measured

Source: Hankard Environmental, Inc. 2001.

vehicles per day under all alternatives. Noise generated by equipment completing routine maintenance, such as snow plowing, would occur over the long term.

The FHWA evaluated long-term noise impacts resulting from only the projected traffic increases using a model that evaluates the noise levels produced by traffic based on the volume, speed, type of vehicles using that roadway, and other parameters. For analysis purposes, seven sensitive receptors were identified along the road: the Beartooth Lake Campground; the Island Lake Campground; the Top of the World Store; the Absaroka-Beartooth Wilderness; the High Lakes Wilderness Study Area; the South Beartooth Highway Roadless Area, and the Line Creek Roadless Area. The only dwelling located along the road is the Top of the World Store, which is typically inhabited from Memorial Day to Labor Day during the tourist season. The Top of the World Store is located about 60 m (196 ft.) from the Beartooth Highway, between Beartooth Lake and Island Lake campgrounds.

The Absaroka Beartooth Wilderness is located north of the project area and is within 322 m (1,056 ft.) of the existing road at the east end of the project area on the west side of the road. The High Lakes Wilderness Study Area is located north and west of the Beartooth Highway. Near a switchback (KP 58.4) locally known as "Deadman's Curve," the boundary of the study area comes within 91 m (300 ft.) of the road. The South Beartooth Highway Roadless Area is directly south of the highway through most of the project area within the SNF. The road is about 76 m (250 ft.) north of the South Beartooth Highway Roadless Area at its closest location. North of the Montana state line at the east end of the project area is the Line Creek Roadless Area. This area is about 610 m (2,000 ft.) from the eastern end of the project area.

Similar to the No Action Alternative, all build alternatives would increase noise levels because of increased traffic. Predicted future traffic noise levels would increase by 3 to 4 dBA, the same as the No Action Alternative at Beartooth Lake Campground, Absaroka-Beartooth Wilderness,

High Lakes Wilderness Study Area, and the Line Creek Roadless Area (Table 36). At the Top of the World Store and Island Lake Campground, traffic noise would increase by 1 to 6 dBA over existing noise levels. Alternative 2 would have the least effect on Top of World Store. Because Alternatives 2, 5, and 6 would align the road closer to the Island Lake Campground, noise levels would increase by 6 dBA, the largest increase at any sensitive receptor location. Future traffic noise levels at Island Lake Campground would be lowest in Alternatives 3 and 4, increasing by 3 dBA (Table 36). None of the alternatives have predicted noise levels that approach or exceed the noise abatement criteria, nor are the predicted levels substantially higher than existing levels.

Cumulative Effects. None of the reasonably foreseeable activities would result in cumulative noise effects.

Resource Commitments. All build alternatives would result in an irretrievable commitment of resources during construction. During construction, noise levels would be higher at sensitive receptor locations. There would be no irreversible commitments of resources.

Proposed Mitigation

The FHWA would consider limiting nighttime construction adjacent to the campgrounds and Top of the World Store, when they are open. The decision would be made in cooperation with the SNF, based on the type of construction required under the selected alternative. The FHWA would describe expected construction noise in the public information program.

References

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3.16 Other Issues

Hazardous Materials

The FHWA completed a Phase I Environmental Site Assessment of the project area to identify areas that may contain hazardous substances or petroleum products. The Top of the World Store sells gasoline and has two aboveground storage tanks. No soil contamination was found when the underground storage tanks were removed in the late 1980s. Used oil was used in the past at the Top of the World Store as dust suppression for the drive. Low concentrations of petroleum hydrocarbons were detected in subsurface materials. Petroleum soil staining was identified at the Ghost Creek materials source, Island Lake moraine, and the Twin Lakes ski area. Any petroleum-contaminated soils encountered during construction would be removed and transported off-site to a solid waste landfill in accordance with the WDEQ's solid waste guideline on the management of petroleum-contaminated soils. Guardrails that contain creosote also were identified. Guardrails would be disposed of at an appropriate facility or reused for an intended purpose.

Relocation, Right-of-Way, Services, and Utilities

All build alternatives would be constructed entirely on National Forest lands; no private lands would be affected. No right of way would need to be acquired. No aboveground or underground utilities are along the corridor.

The Top of the World Store operates under a Special Use permit from the SNF and provides the only services along the road. The access and egress to the store would be modified in all build alternatives. No facilities or structures at the store would be relocated.

Farmlands

All build alternatives would be constructed entirely on National Forest lands; no farmlands or farmland soils would be affected.

Wild and Scenic Rivers

No designated Wild and Scenic Rivers and no Study Rivers are in the project area. A designated river segment is a river segment that has been designated by the U.S. Congress or the Secretary of the Interior as a wild, scenic, or recreational river. Study rivers are segments that were identified for study for their suitability for inclusion in the Wild and Scenic River System. A portion of the Clarks Fork Yellowstone River about 10 km (6 mi.) south of the project area is a designated Wild River. The proposed project would not affect its free-flowing character or its outstandingly remarkable values.

Other Resource Commitments

Resource commitments associated with each resource are discussed previously in this chapter. In addition, considerable amounts of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material would be expended. To the extent practical, the FHWA would recycle and reuse the materials associated with the existing road. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. Use of these materials would be irreversible. However, they are not in short supply and their use would not have an adverse effect upon continued availability of natural resources. Any construction also would require a substantial one-time expenditure of both federal and state funds that would be irretrievable.

Relationship of Short-term Use of the Environment and the Maintenance and Enhancement of Long-term Productivity

All build alternatives would require short-term use of the environment. Uses of the environment for any of the build alternatives would be:

- Filling wetlands and riparian areas with road material.
- Paving vegetation communities and wildlife habitat.
- Displacing wildlife during construction.
- Adversely affecting the historic road and up to four historic bridges.
- Increasing turbidity in area streams and increasing dust in the air.
- Altering existing visual quality by constructing a wider road and shoulders.
- Using an existing campground for highway construction.
- Delaying traffic, which may alter visitor use and affect local economies.

Long-term productivity would be maintained or enhanced by the proposed project and would include:

- The recreation user experience would be improved.

- Maintenance costs associated with the road would be reduced and jurisdiction of the road would have a greater likelihood of being resolved.
- An important historical link between Red Lodge, Montana and YNP would be maintained and improved.
- Future traffic would be accommodated.

3.17 Comparison of Alternatives

On the following pages, Table 38 compares the effects of the alternatives relative to the significant issues identified in Chapter 2. Summary statements in this table are abbreviated and taken out of context to provide a quick comparison by resource. The reader is encouraged to review the supporting analysis in Chapter 3.

Table 38. Comparison of the alternatives.

Resource	Alternative 1 No Action		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6 (Preferred)	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Estimated Construction Cost	$0		$45.7 million		$44.4 million		$50.8 million		$47.6 million		$47.8 million	
Disturbed Area Summary												
Total disturbed area	26	64	103	256	96	240	99	245	96	237	101	249
Existing disturbed area (road, etc.) w/in construction limits	26	64	25	62	26	64	25	62	23	57	25	62
New disturbed area	0	0	78	194	71	176	74	183	73	180	76	187
Abandoned road sections	0	0	6	14	4	9	6	14	7	16	8	19
New disturbed area is the area that would be disturbed that is not already disturbed by the road and material sources. In Alternative 2, 256 – 62 = 194 ac. of new disturbance. In Alternative 2, 14 ac. of existing road sections would be abandoned and subsequently reclaimed.												
Wetlands Impacts												
Jurisdictional wetlands	0.0	0.0	2.4	6.0	2.2	5.4	2.5	6.1	1.9	4.8	2.0	5.0
Non-jurisdictional wetlands	0.0	0.0	0.6	1.6	0.6	1.5	0.7	1.7	0.6	1.4	0.6	1.5
Fens	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**3.0**	**7.6**	**2.8**	**6.9**	**3.2**	**7.8**	**2.5**	**6.2**	**2.6**	**6.6**
Probable Wetland Mitigation												
High Priority Sites	0.0	0.0	1.4	3.4	0.3	0.7	0.3	0.6	1.4	3.6	1.5	3.6
Low Priority Sites	0.0	0.0	0.6	1.5	0.6	1.4	0.6	1.5	0.6	1.6	0.6	1.6
Total	**0.0**	**0.0**	**2.0**	**4.9**	**0.9**	**2.1**	**0.9**	**2.1**	**2.0**	**5.2**	**2.0**	**5.2**

Table 36. Comparison of alternatives (continued).

Resource	Alternative 1 No Action		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6 (Preferred)	
	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Vegetation, Timber, Old Growth Forest												
Vegetation communities disturbed by road construction												
Alpine meadow	0	0	28	68	26	63	26	66	24	60	27	66
Mountain meadow	0	0	15	38	13	34	15	37	16	40	17	42
Wet meadow	0	0	4	10	4	9	4	10	3	8	3	8
Forest	0	0	15	38	12	29	13	31	13	31	13	33
Shrub grassland	0	0	11	28	11	28	11	28	11	28	11	28
Rock outcrop/talus	0	0	4	10	4	9	4	10	4	9	4	10
Total	**0**	**0**	**78**	**194**	**71**	**176**	**74**	**183**	**73**	**180**	**76**	**187**
Vegetation communities permanently affected												
Alpine meadow	0	0	8	20	7	18	8	22	7	18	7	17
Mountain meadow	0	0	4	9	3	6	3	8	4	9	4	10
Wet meadow	0	0	2	4	2	4	2	4	1	3	2	4
Forest	0	0	3	8	2	6	3	7	3	7	3	7
Shrub grassland	0	0	0	0	0	0	0	0	0	0	0	0
Rock outcrop/talus	0	0	1	4	1	3	2	4	1	3	1	3
Total Impact	0	0	18	45	15	37	18	45	16	40	17	41
Rare plants permanently affected												
U.S. Forest Service sensitive species	0.0	0.0	5.0	12.3	3.4	8.5	3.8	9.5	4.3	10.6	4.5	11.1
Wyoming species of concern or watch list species	0.0	0.0	1.3	2.9	0.9	2.6	2.1	4.9	0.9	2.6	1.1	2.8
Old growth forest permanently affected												
Old growth forest	0	0	15	37	11	27	12	30	12	30	13	31

Table 36. Comparison of alternatives (continued).

Resource		Alternative 1 No Action		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6 (Preferred)	
		ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.	ha	ac.
Wildlife													
Whitebark pine habitat permanently affected													
Total		0	0	10	24	7	16	7	17	7	17	8	19
Grizzly bear habitat permanently affected													
Total (by season is below)		0	0	10	24	7	17	8	20	8	20	8	21
Spring Season (March 1 to May 15)													
Low		0	0	10	23	7	16	7	19	8	20	8	21
Medium		0	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
High		0	0	0	0	0	0	0	0	0	0	0	0
Estrus (May 16 to July 15)													
Low		0	0	8	20	7	14	6	17	7	17	7	18
Medium		0	0	2	4	1	3	2	3	1	3	1	3
High		0	0	0	0	0	0	0	0	0	0	0	0
Early Hyperphagia (July 16 to August 31)													
Low		0	0	8	20	6	13	6	16	6	16	6	17
Medium		0	0	2	4	2	4	2	4	2	4	2	4
High		0	0	0	0	0	0	0	0	0	0	0	0
Late Hyperphagia (September 1 to November 30)													
Low		0	0	5	12	4	9	4	10	4	12	4	11
Medium		0	0	3	6	2	4	2	5	3	5	2	6
High		0	0	2	4	1	4	2	4	2	4	2	4

Table 36. Comparison of alternatives (continued).

Resource	Alternative 1 No Action		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6 (Preferred)	
Cultural Resources												
Length of new alignment outside areas of existing alignment in the five realignment areas												
	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.	m	ft.
Total	0	0	4,371	14,340	1,705	5,594	3,077	10,096	5,150	16,897	4,587	15,048
Total centerline length	0	0	30,014	98,472	29,928	98,189	28,899	94,813	29,430	96,557	29,972	98,333
Other Cultural Resource Effects	Long-term deterioration and degradation of the road, bridges and culverts could result in a loss of function and integrity, adversely affecting five resources.		All build alternatives would alter the footprint and location of the roadway, and, except for Alternative 2, would remove four historic bridges and three culvert headwalls, adversely affecting the resources. One bridge, Little Bear Creek bridge #2, would not be removed in Alternative 2. However, once it is removed from the highway alignment, if would no longer serve the function for which it was originally built, thereby creating an adverse effect. Although the bridges and culvert headwalls would be reconstructed using salvaged historic materials or using similar materials from the project area, such work would adversely affect them. The characteristics of setting, feeling, association, and location of the road would be preserved in all build alternatives.								
Socioeconomics	Economies in the project area would risk losing tourism because of the road's continued deterioration.		The population in Park County, Wyoming and Carbon County, Montana would increase temporarily because of employment of about 80 seasonal construction workers. Local businesses providing lodging, meals, equipment, fuel, operating supplies, and other consumer goods and services would benefit from increased expenditures by construction workers. Traffic delays associated with construction activities on the road would adversely affect regional tourism in the short term. In the long term, the road would be significantly improved, which would increase a driver's sense of safety for the increasing numbers of tourists who travel the road each year.								
Land Use	No effect.		Construction activities along the road would temporarily disrupt recreation, grazing, and wildlife habitat. Some grazing lands and wildlife habitat would be lost permanently. All build alternatives would comply with the Shoshone National Forest Land and Resource Management Plan.								
Soils, Geology, and Paleontology	No effect.		No paleontologic resources were identified in the project area. All build alternatives would require rock blasting and larger cuts and fills, affecting the area's topography. Soil losses would be higher from wind and water erosion, particularly during construction. Erosion rates would decrease as vegetation on slopes becomes established. Soil productivity would be lower on reclaimed areas than adjacent areas.								

Table 36. Comparison of alternatives (continued).

Resource	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 (Preferred)
Air Quality	No direct effect. Increased traffic would result in increased vehicular emissions.	During the 6-year construction period, construction activity such as traffic, blasting, excavating, and loading, would increase dispersed dust and mobile exhaust emissions. Asphalt production would generate hydrocarbon emissions. Applicable air quality standards would not be exceeded. Long term, increased traffic would increase vehicular emissions, but would not exceed applicable air quality standards.				
Transportation	Inadequate road conditions would remain. Responsibility for maintenance would remain with the Department of the Interior.	All build alternatives would improve the road surface, retaining walls, and bridges. Ease of maintenance would increase. The Wyoming Transportation Commission would consider assuming road ownership. In all build alternatives, road construction would result in increased congestion and traffic delays during the construction season (April through October) of the 6-year construction period. Truck traffic could increase up to 150 to 200 truck trips per day during peak construction periods. In all build alternatives, operating speeds may increase in some locations by about 8 km/h (5 mph). Future accident rates in the build alternatives are predicted to be about 40 percent less than in the future No Action alternative.				
Water and Aquatic Resources	No direct effect on water and aquatic resources. Some bridges and culverts may fail, impacting water quality.	Potential impacts from all build alternatives on water and aquatic resources include sediment transport and atmospheric deposition of particulates into streams and lakes. Short-term increases in sediments and turbidity would not result in significant water quality degradation or loss of beneficial uses.				
Visual Resources						
% of sections with high scenic quality	57	60	57	62	61	64
% of sections with high landscape sensitivity	28	28	27	24	26	24
% of sections with high external visibility	8	16	16	15	16	16
General Effects	No effect on the visual character of the road.	During construction, visual quality would be adversely affected by dust, the presence of construction equipment, and nighttime lighting. All build alternatives would permanently alter the visual landscape because of the wider road and larger cuts and fills. Disturbed areas would be revegetated, but would have different lines, colors and textures than the adjacent landscape.				

Table 36. Comparison of alternatives (continued).

Resource	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 (Preferred)
Recreation						
General Effects	No effect on existing recreation opportunities available along the Beartooth Highway.	During construction of all build alternatives, activities such as temporary road closures and noise from construction equipment along the road may inconvenience recreationists such as bicyclists, hikers, and campers near the road. Alternative 2 would best accommodate recreation uses along the corridor, and would include wider shoulders, more and larger pullouts and parking areas, and the slowest design speeds. Alternatives 4 and 6 would accommodate all recreation uses, but to a lesser degree. Alternatives 3 and 5 would not accommodate all recreation uses west of Long Lake. Reconstruction of U.S. 212 from Yellowstone National Park to the Montana/Wyoming state line near Cooke City combined with the proposed project may displace recreation use along U.S. 212 between 2005 and 2007.				
Shoulder width in m/ft. (wider better accommodates bicyclists and pedestrians)	0 / 0	1.2 / 4	0.6 / 2	1.2 / 4	0.6 / 2	0.9 m (3 ft.) west of Long Lake and 0.6 m (2 ft.) east of Long Lake
Number of pullouts	114	77	36	62	31	66
Noise						
General Effects	Slight increase in traffic noise over the long term.	In all build alternatives, construction noise would be higher than existing noise levels at area campgrounds, at the Top of the World Store, and in adjacent wilderness and roadless areas. After the 6-year construction period, construction noise would cease. Slight increase in traffic noise over the long term.				

Table 36. Comparison of alternatives (continued).

Resource	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 (Preferred)
Section 4(f)						
Recreation Sites	No effect on campgrounds.	Noise from construction would increase in the two campgrounds in all build alternatives. The increased noise would not substantially impair the use of the campgrounds and would not be a constructive use. In Alternatives 2, 5, and 6, the road would be about 100 m (330 ft.) closer to the Island Lake Campground than the existing road. The closer alignment in Alternatives 2, 5, and 6 would not substantially impair the use of the campground and would not be a constructive use.				
Historic Sites	Long-term deterioration and degradation of the road, bridges and culverts could result in a loss of function and integrity, adversely affecting five resources.	The five historic properties would be adversely affected in all build alternatives. Except for avoiding one bridge in Alternative 2, no feasible and prudent alternatives to avoid adversely affecting the properties were identified. Although one bridge would be avoided in Alternative 2, it would no longer serve the function for which it was originally built, thereby creating an adverse effect. Measures to minimize harm to the properties would be implemented. Fox Creek Campground, located 11 km (7 mi.) southeast of Cooke City, is the preferred workcamp location in all build alternatives. The use of this campground as a workcamp would not be a Section 4(f) use.				